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Environmental Protection Agency 1981-1990 ADP Requirements Study Conversion Study, Technical Report

Informatics, Inc, Rockville, Md

Prepared for

Environmental Protection Agency, Washington, D C Management Information and Data Systems Div

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ENVIRONMENTAL PROTECTION AGENCY
1981 – 1990 ADP REQUIREMENTS STUDY

Conversion Study
Technical Report

Prepared For:

Environmental Protection Agency
Management Information and Data Systems Division
Washington, D. C. 20460

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The purpose and objectives of the Environmental Protection Agency (EPA) Automated Data Processing (ADP) planning activities are to obtain the most cost-effective computing/telecommunications resources to meet EPA's computing requirements for the 1981 through 1990 time period. A detailed system study was performed, which identifies the current and projected ADP requirements for the period 1981 through 1990. Each ADP activity is identified ~~utilizing~~ Zero Based Budget (ZBB) decision units and then projected ~~utilizing~~ a multiple scenario approach. The final documents of this report are:

Consolidated Systems Study:- Volume I - Executive Management Summary; Volume II - Detailed Report; Volume III - Appendices including microfiche details (3) fiche.
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1981-1990 ADP REQUIREMENTS STUDY
CONVERSION STUDY

Technical Report
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FINAL REPORT

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SECTION 1

OVERVIEW AND EXECUTIVE SUMMARY

1.1 PROJECT PURPOSE AND OBJECTIVES

The purpose and objectives of the EPA ADP Planning Activity are to obtain the most cost effective computing/telecommunications resources to meet EPA's computing requirements for the 1981-1990 time period. EPA has developed a comprehensive plan which closely follows the Office of Management and Budget (OMB) Circular A-109 (Major System Acquisition) process. The EPA plan addresses:

- Detailed system study with total management participation to establish short and long term needs.
- Detailed study of the current and projected telecommunication needs of the agency.
- Study of the impact of conversion to different hardware in terms of cost and time.
- Development of an ADP acquisition strategy to obtain the necessary computing/telecommunication resources.
- Generation of a Request for Proposal (RFP) to develop alternative system design concepts to meet EPA's needs.
- Demonstration of these design concepts to reduce risk and to determine total cost.
- Procurement of the required resources and services which provide the greatest benefit to the government.

In conjunction with this overall plan, EPA contracted with Informatics to assist them in performing all activities leading up to the issuance of the RFP for alternative system design concepts. This contract has to date resulted in the following documentation:

- Detailed methodology and plan for conducting the ADP requirements study and for making long term projections of needs. Titled Phase I Final Report, dated April 8, 1977.

- Consolidated System Study dated December 14, 1977, which presents the detailed current EPA computing workload and projects that workload for the years 1979-1981-1985-1990.

- Consolidated Telecommunications Study dated December 14, 1977, which presents the detailed current telecommunications workload by location and projection of future workload by location for 1979-1981-1985-1990.

This document is the Conversion Study Report and represents the impact upon EPA of converting existing ADP activities operated at the IBM and UNIVAC facilities to upgraded hardware of either the same type or other types. In addition, this document identifies the specific information which must be made available to the system design contractors in order to determine the total cost of their alternative design concepts. This document in conjunction with the Consolidated System Study and the Consolidated Telecommunications Study, represent the EPA statement of needs for the current and future time periods.

The contents of this document address the following:

- Identification of conversion workload factors;

- Application of these factors to current systems;

- Planned or developmental systems for operation prior to conversion;

- Projected conversion workload and costs based on 1981 workload values, as projected by the Consolidated System Study;

- Planning considerations for the conversion process.

This report represents the results of an intensive data gathering effort at all levels of EPA, including headquarters, regional offices and laboratories. It provides an analysis of this data and a projection of costs, timetables, planning factors, and governing Federal regulations for consideration in the conversion to new ADP equipment in the 1981 time period.

1.2 REPORT ORGANIZATION AND CONTENT

This report is organized as follows:

Section 1: contains an overview of conversion workload projections and a summary of conclusions and recommendations.

Section 2: contains a presentation of the study methodology and factors and scenarios involved in the conversion process.

Section 3: a presentation of current conversion workload statistics used as a baseline for projecting 1981 conversion workload and costs.

Section 4: projected 1981 conversion workload factors and estimated costs for compatible and non-compatible system conversion scenarios.

Section 5: conclusions and recommendations developed from analysis of the projected conversion workload, conversion timetable projections, and recommended EPA conversion planning guidelines under governing Federal procurement regulations and policy.

1.3 STUDY METHODOLOGY

The primary goals of the conversion study were to develop the scope of the conversion effort and provide the necessary planning considerations for the systems design contractor. The following steps were taken in the methodology to accomplish these objectives:

- Definition of all elements involved in conversion of ADP systems to new hardware and operating concepts.
- Definition of the alternative scenarios possible in converting from existing hardware at COMNET (WCC) and NCC to compatible or non-compatible hardware and operating concepts. Each scenario was then utilized in the determination of conversion workload impact.
- Data gathered in the review of EPA systems were projected to 1981 (as reported in the Consolidated Systems Study Report of July 15, 1977) for key conversion values such as software volumes, data base volumes, software languages, and system development plans.
- Conversion workload factors were developed and applied to the 1981 projected conversion volumes to estimate total conversion costs and timetables.
- Conversion planning considerations were developed based upon the needs of future system design efforts and governing Federal regulations.

The following subsections discuss each of these steps and the results obtained in the conversion study methodology.

1.4 CONVERSION WORKLOAD ELEMENTS

Elements of the EPA conversion process necessary for transferring ADP systems and operations to new hardware and operating concepts were defined as the first step in the conversion study methodology. Each of these elements would be considered work tasks in the conversion project and include the following:

- Software conversion for computer programs and packages, to enable their use on new hardware. Depending upon the degree of change from old to new hardware and operating concepts, redesign and reprogramming of software may be a requirement in this task area.
- Data base conversion for reloading of system files into the new hardware system. Differences in file organization and management characteristics in new hardware or operating concepts may require reorganization and redesign of data base structures and subsequent redesign of software accessing these files.
- Training of system end users, systems and programming staff, and operations personnel in the operating concepts of the new ADP hardware.
- Documentation changes and updates for system and user levels, incorporating system design modifications and operating protocols of the new system.
- Acceptance testing of converted and redesigned systems, resulting in the assurance of satisfactory system operation before turnover to an operational status. Included in acceptance testing are the requirements for parallel operations on the old and new systems and file-to-file comparisons between the files on the old system and the converted files on the new system.

1.5 ALTERNATIVE CONVERSION SCENARIOS

Conversion workload varies widely depending upon the degree of difference between old and new ADP hardware and operating concepts. The current OSI/COMNET conversion project would be an example of a compatible conversion scenario with minimal impact upon software design and operating concepts. In this case, all software and data base structures remain intact and conversion tasks are limited to the physical transfer of programs and data files, and retraining in the operating conventions of the new system.

The conversion several years ago at NCC from an IBM 360/50 to a UNIVAC 1110 is an example of a non-compatible scenario where differences in computer operating systems and machine dependent architecture led to a total redesign of most software and data base structures. Although much of the existing software at NCC was in COBOL and FORTRAN languages, considerable redesign was necessary due to major vendor differences in system utilities, job stream management, job control language, and data base organization. Approximately $350,000 for contractor support, 12 to 15 man-years EPA effort ($300,000), and two to three years were required to optimize and redesign just one system (SAROAD) to match the design and operating characteristics of the new hardware system.

A combination of compatible and non-compatible scenarios is still another possibility in the case of a single hardware or service center procurement which is compatible to either WCC (COMNET) or NCC hardware but not compatible to both. In the case of a WCC compatible scenario this would indicate IBM or IBM compatible (Amdahl, Itel, etc.) hardware, or in the case of NCC, Univac equipment would be selected.

This would result in the non-compatible half of the EPA ADP operation falling under the non-compatible scenario while the other half results in a compatible scenario similar to the OSI/COMNET conversion.

1.6 CONVERSION WORKLOAD PROJECTIONS

A comprehensive survey of major EPA systems was performed in Phase II of the ADP Requirements Study project in order to provide a baseline for projecting future computing needs. Interviews with EPA management and selected ADP activity managers were held to ascertain current data processing workload and indications of workload growth from 1981-1990. Data collected in these surveys was presented in the Consolidated Systems Study report of July 15, 1977. Conversion projections for data base volume in 1981 were obtained from the statistics presented in this report. Software conversion workload projections were obtained from ADP activity survey forms and from supplemental contact with system managers and ADP coordinators. These 1981 system conversion volumes and characteristics were then analyzed and used as the basis for estimating total conversion workload and costs for each conversion scenario in the 1981 EPA conversion time period.

Software conversion workload projections were based upon a sampling of nine selected systems representing a cross section of systems operating at WCC and NCC. These nine systems included STORET, SAROAD, PPIS, PCS, GICS, NEDS, Energy Data System, TSSMS, and ORD/OEMI Technology Assessment. These systems were then analyzed in detail for software volumes and characteristics impacting the conversion process for compatible and non-compatible scenarios.

Workload standards were developed based upon previous Informatics experience in similar conversion efforts and were applied to the software volumes to derive a conversion workload value for each system in the sample. These workload standards are as follows:

- Compatible Scenario. Assumes same type hardware and operating system with differences in command language and operating conventions, similar to the OSI/COMNET conversion.
    - Contractor technical effort: 1/2 man-day[1] for each single job step (retrieval/output) program and 2 man-days for each multiple job step program.
    - EPA contract management and technical review effort: 0.1 man-day for each single job step program and 0.4 man-day for each multiple job step program.
- Non-Compatible Scenario. Assumes that all programs and job streams would require some level of redesign due to differences in operating systems, system utilities, and file management capabilities, and that portions of ANSI COBOL and FORTRAN programs would be reusable in their original form.
    - Contractor technical effort: 15 man-days[2] for average size (100-500 lines of code) single job step programs, with a range of 5 to 30 man-days for smaller or larger programs. 30 man-days for multiple job step programs of average size (500 to 1000 lines of code), with a range of 10 to 60 man-days for smaller or larger programs.
    - EPA contract management and technical review effort: 3 man-days for single job step programs with a range of 1 to 6 man-days for smaller or larger than average size programs. 6 man-days for multiple job step programs with a range of 2 to 12 man-days.

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1. The Office of Research and Development states that 3 man-days per job step is a better estimate.
2. The Office of Research and Development states that 75 man-days per job step is a better estimate.

The following software conversion workload totals were obtained when the workload standards were applied to software volumes for the nine systems in the sample (see Figure 4-1 on page 4-6):

- Compatible Scenario: 1108 contractor man-days
  222 EPA person-days
- Non-Compatible Scenario: 25900 contractor man-days
  5180 EPA person-days

After analysis of the remaining EPA systems not covered in the sample, it was determined that the sample represented approximately 25% of the total EPA software conversion workload for WCC systems and 20% of the workload for NCC systems. The variance in the sample representation between WCC and NCC is due to the larger number of WCC systems in the sample (5), one of which is STORET, more than twice the size of any other system in the sample.

1.7 CONVERSION COST PROJECTIONS

Software conversion cost projections were based upon average contractor charges of $4000 per man-month for the compatible scenario effort and $5000 per man-month for the use of more senior personnel in the non-compatible scenario. This resulted in a total estimated contractor cost of $939,000 for software conversion of all EPA systems under a compatible conversion scenario and a total estimated cost of $27,662,500 for the non-compatible scenario. The compatible scenario used for these projections assumed that both WCC and NCC operations would be converted to compatible hardware. The non-compatible scenario considered that both operations would be converted to non-compatible ADP systems, i.e., not IBM-compatible and not Univac-compatible.

The combination scenarios involving compatible conversion at either WCC or NCC and non-compatible conversion at the alternate were compared for software conversion costs. Considering a scenario involving WCC compatibility and NCC non-compatibility (IBM, Amdahl, Itel, etc.) a total software conversion cost estimate of $9,488,500 was estimated for contractor charges. An NCC compatible scenario (Univac) that would be non-compatible with WCC systems is estimated at $19,113,000 for contracted software conversion costs.

Additional cost and resource estimates were projected for the remaining elements in the conversion process to develop the total estimates for each scenario shown in Figure 1-1.

Conversion Activity	Scenario			
	All Compatible	WCC Compatible	NCC Compatible	All Non-Compatible
Software Conversion & Testing - Contractor Personnel - Computer Time	 $ 939,000 500 hrs.	 $ 9,488,500 3700 hrs.	 $19,113,000 6800 hrs.	 $27,662,500 10,000 hrs.
Data Base Conversion - Contractor Personnel - Computer Time	 $ 20,000 300 hrs.	 $ 200,000 2700 hrs.	 $ 420,000 5100 hrs.	 625,000 7500 hrs.
Parallel Operation of Converted Systems - Computer Time	300 hrs.	2700 hrs.	5100 hrs.	7500 hrs.
User Training	$ 50,000	$ 450,000	$ 850,000	$ 1,250,000
IRS & S2K Conversion	N/A	N/A	N/A	$ 400,000
User Documentation	$ 125,000	$ 500,000	$ 875,000	$ 1,250,000
Total Contractor Personnel	$1,134,000	$10,638,500	$21,258,000	$31,187,500
Total Computer Time*	1100 hrs.	9100 hrs.	17,000 hrs.	25,000 hrs.
Total Computer Costs ($800 per hour)	880,000	$ 7,280,000	$13,600,000	$20,000,000
Total Conversion Costs	$2,014,000	$17,918,500	$34,858,000	$51,187,500

*Computer time estimates are subject to an increase of up to 100% as stated in Section 1.9.

Figure 1-1. Conversion Cost Estimates

In planning for conversion, caution is advised since it is possible that the average conversion workload figures stated in this report and used for projecting workload may be on the low side when the final target hardware is chosen. If the selected hardware is as non-compatible and dissimilar to existing WCC and/or NCC hardware as was the case in the IBM to Univac project, then workloads of double or more than those projected in this report are definitely within the realm of possibility.

1.8 CONVERSION TIMETABLE PROJECTIONS

Timetable projections for the conversion effort were based on an assumption of maximum man-loading of 15 to 20 analyst/programmers per system, including management. Smaller systems would be staffed with proportionately smaller man-loadings so as to maximize efficiency and control. Based upon these staffing levels, a timetable of 12 months was estimated for a totally compatible scenario. This compares to a planned 8 month timeframe for the current OSI/COMNET conversion, based upon 1977 workload volumes.

Considering that at least one of the two EPA computer centers will most likely undergo a non-compatible conversion effort, a timetable of two to three years is projected for conversion to non-compatible ADP hardware. A WCC compatible scenario would require closer to two years while the NCC compatible scenario would involve three years due to the greater software workload on the WCC system. A totally non-compatible scenario would also require a three year period with parallel conversion efforts at WCC and NCC operations. The majority of EPA systems could be converted within the first two years, but larger systems such as STORET and SAROAD would require longer leadtimes considering their greater complexity and the use of manageable levels of project resources.

1.9 ADDITIONAL CONVERSION COST AREAS

Further conversion cost areas beyond those considered in the preceding software conversion section include provision for machine time in software conversion testing, data base conversion, redesign and conversion of data base management software packages, training, and user documentation. These additional cost areas are estimated in the following subsections and represent "average" conversion situations for both compatible and non-compatible scenarios. It should be noted that these estimates may fluctuate widely depending upon the degree of change from existing WCC/NCC hardware and the new equipment. Hardware as divergent as in the case of the IBM to Univac conversion at NCC could represent an increase of as much as 100% over the projections listed below for less widely disparate hardware relationships.

- Machine Time for Software Conversion: Allowance for machine time in software conversion efforts is usually included in hardware lease costs when being bid by the hardware vendor. However, in the case where an independent software house is providing the software conversion service, this may result in additional costs unless the hardware utilized is purchased or leased and is in place and available for use. Usually, however, the conversion process begins long before the leased or purchased hardware arrives, thereby resulting in additional front-end software conversion costs. In the case of a service center operation such as that provided by COMNET, machine time costs for conversion may be imbedded in total system charges but they remain an item impacting the overall system charge schedule. Computer resource costs will be incurred on both old and new systems during the parallel testing phase.

Considering the software conversion workload values projected in Section 4.3, an estimated 500 resource hours of machine time would be required for the compatible conversion scenario, primarily for acceptance testing and parallel operation. Non-compatible conversion would require significantly greater machine workload for unit testing, systems testing, and acceptance testing, and would entail an estimated 10,000 resource hours of machine time for all EPA systems. WCC compatible conversion would require 3700 hours and NCC compatible conversion would utilize an estimated 6800 resource hours.

- Data Base Conversion: Factors involved in conversion of data base files under the compatible scenario would include physical transfer, dumping and reloading, and possible renaming and reorganization of files depending upon operating conventions of the new system. Non-compatible data base conversion is highly dependent upon the differences in file management characteristics between old and new systems. Worst case changes could involve restructuring of all non-sequential disk files. Sequential disk files and tape files would require more minor changes to file names and blocking factors and possible word length adjustment and code translation of data elements. Special software would be required for non-compatible data base translation and reloading into restructured file organizations.

  Compatible scenario data base conversion would involve an estimated five man-months of conversion activity or approximately $20,000 (at $4000 per man-month). Machine time requirements for dumping, reloading and acceptance testing (file to file comparisons) would involve an estimated 300 resource hours. Non-compatible scenario data base conversion would involve an estimated 125 man-months or $625,000 (at $5000 per man-month). Machine time for dumping, conversion processing, reloading, and acceptance testing would require an estimated 7500 resource hours for all EPA systems. WCC compatible conversion would require $200,000 personnel time and 2700 computer resource hours; NCC compatible conversion is estimated at $420,000 and 5100 computer hours.

- Conversion of Data Base Management Software: Conversion of IRS and S2K software packages to non-compatible hardware, i.e., other than IBM compatible or Univac hardware, should be a serious consideration, since over 35 major EPA systems use these packages. Conversion of statistical packages may also be cost-beneficial for use in ORD areas. IRS and S2K conversion is not a consideration for compatible scenario conversion, since both IBM and Univac equipment scenario conversion, since both sions of these packages. Conversion of IRS to a non-compatible ADP system would involve $100,000 to $150,000 for redesign and rewrite of the 30,000 lines of code. Six to eight calendar months would be required, according to Sigma Data Corporation. S2K would be approximately twice as much due to its greater size and complexity.

- User Training: Retraining effort for the compatible scenario would be limited to job control, command language, operating conventions, and programming support. Out-of-pocket expense items would be required only in minimal areas involving programmers, terminal operators, and others with "hands on" system usage functions. This retraining effort could be covered over a six to nine month conversion period by the contractor. In the case of ADP activities with support staffs, EPA personnel could provide applications training, once they themselves had completed training by the hardware or service vendor. An estimated 10 man-months of vendor support would be required for this activity, or $50,000 (at $4,000 per man-month). Impact on EPA personnel undergoing or providing retraining services would involve an estimated 250 man-months of equivalent productive time. Non-compatible scenario retraining would be much more intensive due to extensive redesign of all software and more extreme differences in programming design and support. Retraining of system support staff, where it exists for large systems such as STORET, who in turn could retrain system users would greatly assist this potentially large effort. Training functions for the majority of EPA systems, however, would require contract services for training, particularly in areas involving new computer system methods. An estimated 250 man-months of vendor support would be required for non-compatible conversion, amounting to $1,250,000 (at $5,000 per man-month) for all EPA systems. EPA personnel impact for retraining purposes under this scenario would involve an estimated 1,000 man-months of equivalent productive time. The WCC compatible conversion scenario would require approximately $450,000 and the NCC compatible conversion $850,000 for retraining support.

- User Documentation: Compatible conversion would require changes in command language, job control, programming standards and conventions, compiler and utility support versions, and other basic data in user guide documentation. This effort would entail an estimated 25 man-months, or $125,000 (at $5,000 per man-month) for changes to all system user documentation if such services were performed contractually. Non-compatible scenario documentation changes would be more severely impacted by extensive system redesign in addition to those changes in the compatible scenario. All documentation would require a total rewrite, involving an estimated 250 man-months, or $1,250,000 (at $5,000 per man-month) for all EPA systems. WCC compatible conversion would involve approximately $500,000 and NCC compatible conversion $875,000.

1.10 CONCLUSIONS AND RECOMMENDATIONS

The magnitude of the conversion effort for EPA in 1981 cannot be over-emphasized. Even if both WCC and NCC conversions were targeted for compatible hardware, the effort in total would represent the largest ADP undertaking in EPA history. Considering that at least one of the two current operations sites will most likely have to convert to a non-compatible ADP system, the conversion process becomes critically dependent upon proper management planning and control. Preparation for the eventual conversion process should focus on several key areas involving standards and plans:

- Software Classification and Inventory. Required to accurately size the software conversion problem for each alternative system design concept. This task will be performed by the systems design contractor in order to determine the impact of conversion upon their design concepts. EPA must cooperate in providing this information from WCC and NCC program libraries in the next project phase.[1]
- Data Base Classification and Inventory. Required for sizing of data base conversion workload for each applicable system design concept. This task will also be performed by the systems design contractor. Data base libraries at WCC and NCC must be made available to the contractor to enable completion of the data base inventory in the next project phase.[1]
- System Interface Inventory. Required to provide interrelationships of all EPA systems for use in systems design activities in the next project phase.[1] Interface considerations should identify which systems share common data files, software modules, access data files periodically, or have some other linkage or dependence which should be considered. The systems design contractor will need to complete this task in order to develop design

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[1] No time estimate is given for these inventories due to (a) insufficient data on the level of documentation of the various systems and (b) the fact that this is an on-going part of EPA's ADP system management.

concepts fully responsive to the interfacing needs of EPA systems. EPA must ensure that this inventory is maintained in a current condition throughout the entire conversion period for use in redesign activities.

- System Documentation. Required to be completed and maintained for all systems to be converted, according to published EPA standards and Federal regulations. According to Federal regulations, vendors will not be liable for conversion of computer programs for which adequate documentation is not available. This task must be completed before the hardware and conversion RFP is distributed to vendors. Documentation must further be maintained in a current status throughout the conversion period for use in redesign activities. No estimate is given for the cost of preparing adequate documentation due to the lack of data on the level of documentation for the various EPA systems, and the fact that this is an on-going part of EPA's ADP system management.

- Restrictions on Use of Non-Standard Software. Software languages other than those based upon the use of Federal Standard (FIPS) or American National Standard (ANSI) guidelines should be restricted in future use and employed only where cost effectiveness warrants. The same restriction should also apply to software packages which are not commercially available for at least two different manufacturers' central processing hardware. SAS is a commonly used software package that only runs on IBM computers. As such, it is a non-standard package for conversion purposes, and a suitable functional equivalent would be required for a non-IBM computer.

- Conversion of Software Packages. If the non-compatible scenario is selected (hardware not compatible with either IBM or Univac), heavily used software packages such as IRS, S2000, and SPSS should be considered for conversion in comparison with the costs of reprogramming to functionally equivalent proprietary software. Several thousand computer programs and more than 50 systems employ these packages, all of which would require redesign and reprogramming if the packages were not converted.

- Notification to System Users. Restrictions on non-standard software and other conversion preparation aspects should be passed on to all EPA users, states, and other non-EPA users of EPA national systems in order to reduce eventual conversion impact on their operations.

- Contingency for COMNET/NCC Extension of Services. To allow for the situation where a WCC/NCC non-compatible hardware system is selected, a contract extension option should be negotiated with COMNET/NCC in order to protect system operations through the two to three year timetable projected for conversion. With a 1981 start of conversion effort, the period of extended COMNET/NCC coverage should extend at least through 1984.

As a brief summary of conversion planning, short-term efforts should include the completion of software, data base, and system interface inventories. These efforts are to be performed by the systems design contractor with EPA assistance and should be completed in the next project phase (systems design). Longer-term efforts commencing immediately and lasting throughout the duration of the conversion project include maintenance of systems documentation in an up-to-date status, restrictions on the use of non-standard software, and keeping states and other non-EPA users aware of conversion plans and developments.

Current Federal regulations governing conversion were examined and meetings with the General Accounting Office (GAO), the House Government Operating Committee, and the General Services Administration (GSA) were held to develop a methodology for soliciting and evaluating conversion proposals. The outcome of these meetings and studies was that no set procedure exists for conversion in a large ADP services procurement. Every situation is examined on its own merits and handled on an individual basis. Accordingly, the approach EPA has developed for the 1981 procurement is in the best interests of the government and consists of the following criteria.

- Coverage of any EPA information or data system developed, maintained, and operated at any EPA data center shall be based on the use of Federal Standard (FIPS) or American National Standard (ANSI) languages; or, on the software packages which are commercially available for at least two different manufacturers' central processing hardware.

- Redesign criteria will be based upon the need to change systems design to maintain or improve operational efficiency and throughput rates on the new equipment. Basic design must have been stable for such systems for the two years prior to conversion.
- Lowest cost determination will be based upon the total of ADP system cost and conversion cost proposals.

The EPA conversion approach will meet the necessary requirements and intent of Federal policy, but it will also broaden the competition under A-109 to both equipment and systems vendors. It enables a greater possibility of achieving the most cost-effective selection of design and vendors while considering the magnitude of the conversion effort.

SECTION 2

PROJECTION METHODOLOGY

2.1 INTRODUCTION

The objective of the ADP Planning Activity is to obtain for EPA the most cost effective computing/telecommunication resources to meet the computing requirements for the 1981-1990 time period. One of the major considerations in the selection of the means of meeting these requirements is the impact of conversion from the present equipment to new equipment and the impact of a change in systems operations. Major modifications of current operating systems caused by conversions affect the users of the system as well as the operators. The impact is felt in terms of their ability to process data needed to support a program and in terms of cost and time to convert existing applications to new hardware. A transfer of a set of computer programs from one computer to another has an impact on the using organization and may affect operations for a very short time or a long time depending upon the degree of change involved.

Existing General Services Administration (GSA) and General Accounting Office (GAO) guidelines do not permit all conversion costs to be included in the cost determinations to select replacement hardware. These restrictions provide for more competition in selecting system design alternatives and equipment to satisfy these alternatives. If the total impact of conversion were permitted, the current design concept and computing equipment would be perpetuated in those instances where existing applications are to be continued.

This section of the document identifies all conversion considerations and references in detail those which can be included in the selection process. This section also presents the methodology for determining the impact of conversion.

2.2 BACKGROUND

The Environmental Protection Agency (EPA) was formed in December 1970 under the President's Reorganization Plan Number 3. Essentially, it was formed to provide a focal point at the national level for monitoring and improving the nation's environment.

The agency was created through the transfer of a number of organizations which had previously been part of other governmental agencies. This was not the acquisition of a number of units into an established organization, but the merger of units which were to become the organization. Therefore, there was no pre-existing management structure or staff. As a result, most of the systems work had been done by staffs at higher levels of the agency involved and these staffs remained with their present organizations. In addition, EPA inherited duplicative systems which had been developed for specific uses by particular agencies. Moreover, many of the systems were not well suited to EPA's size and mission. In the transfer, EPA was provided with no hardware or operators in the Washington metropolitan area; the only equipment provided was an IBM 360-50 located at Research Triangle Park, North Carolina.

To provide the required local hardware support, EPA contracted, initially with Boeing and then with Optimum Systems Inc. (OSI), to obtain an IBM support facility. In addition, EPA utilized some computer facilities of other Federal agencies such as the Department of the Interior and the U.S. Geological Survey. It also upgraded the IBM 360-50 at RTP to a UNIVAC 1110. During this transition, many of the computer programs and systems were completely revised and upgraded to meet the requirements of the user organizations.

EPA headquarters and field operations were provided with a limited number of staff members to operate and manage the entire ADP activity for EPA. Due to limited personnel, EPA has become dependent on contractor support for ADP services, including such activities as feasibility studies, system design, computer programming, conversion, facility management, and other related activities.

In 1976, EPA initiated a limited competitive procurement to provide IBM 370/168 resources for the interim (4 year) period from 1977 to 1981. In addition, the UNIVAC facility has been twice upgraded to meet the growing demand for services. COMNET was awarded the IBM support contract, and they are currently in the process of converting existing programs from the OSI facility to their facility. This contract will expire at the end of 1981. In order to get approval of this limited competition interim upgrade, EPA had to give assurances of a fully competitive procurement for total EPA ADP services in the 1981 time period. Thus, the reason for the performance of this study at this time.

EPA has implemented distributed processing resources in some EPA regions and laboratories. These are currently in the process of becoming operational. It is anticipated that additional distributed processing will take place prior to 1981 and, therefore, consideration must be given to determining the long-term ADP requirements.

2.3 ADP REQUIREMENTS STUDY

The purpose and objectives of the ADP Requirements Study are to provide for the development of a comprehensive plan for providing the most effective computing center/telecommunications resources to meet EPA's computing requirements for the period 1981 through 1990.

The methodology for developing this comprehensive plan is as follows:

- Review of existing EPA systems
- Develop a projection methodology to extend requirements to the 1981-1990 time period
- Perform a detailed current and future workload analysis of ADP systems
- Identify current and future telecommunication workloads
- Identify potential conversion workload

Each of these steps has a number of detailed tasks which must be performed to accomplish its final objective. Therefore, each will be addressed separately with a detailed discussion of the methodology used to perform the step. This document is a presentation of the potential ADP conversion workload for the 1981 EPA procurement cycle.

2.3.1 Review of Existing EPA Systems

A number of documents were provided which represented studies previously done for EPA concerning the systems currently being utilized by many of the EPA organizational entities. In addition, the contractor was provided with a complete set of all General Services Administration (GSA)/Office of Management and Budget (OMB) directives regarding systems acquisition.

Informatics reviewed these documents and developed a comprehensive list of the requirements which needed to be addressed. In addition, existing documentation was reviewed to determine which of these requirements could be met with existing data. The conclusion was that the GSA/OMB regulations called for detailed workload data associated with each significant ADP activity and that these data were not currently available. To collect the necessary detailed workload data on a system-by-system basis, Informatics developed a set of forms which incorporated the specific needs of the regulations.

Discussions were held with system managers to determine their ability to project future system requirements and it was learned that long term requirements were dependent on other factors for which they had no control. These factors included potential future changes in the areas of: total EPA budget; priorities of programs and missions; new legislation; and changes in management philosophy towards the use of ADP. It was determined that this information could only be obtained through discussions with the EPA management. Therefore, Informatics developed a survey form and scheduled meetings with all available members of the EPA management. Included in the scheduled interview process were the following levels of management:

- EPA Administrator
- EPA Deputy Administrator
- Assistant Administrators (new and old)

- Deputy Assistant Administrators
- Office Directors
- Program Managers
- Regional Administrators
- OMB Budget Examiners
- Members of the EPA Congressional Committees

The data to be collected from these interviews were to be structured, analyzed, and quantified to determine the long-term effect on EPA ADP activity. However, because of the span of time to be considered (13 years) and the ever-changing emphasis on some of the problems (e.g., energy), alternative futures had to be taken into account. Therefore, the management survey forms included questions concerning the potential impact on EPA's future if either negative national situations took place or if the need for environmental concerns became greater. The data collected from these survey items would be used to develop multiple scenarios concerning EPA's future.

In Phase II of this study, Informatics used these approved survey forms and conducted interviews with all available managers and selected ADP activity managers. The ADP activity documented by Informatics represented approximately 79% of the total dollars requested for agency sponsored timesharing as shown in the Zero Base Budget (ZBB). Data on the remaining ADP Activity was collected by EPA and provided to Informatics.

2.4 CONVERSION METHODOLOGY

The goals of the conversion study were to develop an estimation of the total workload effort involved in converting to new ADP systems, and to set forth planning and management considerations in preparation for the conversion effort. The following steps were taken in the methodology to reach these objectives:

- Identification of workload elements in the conversion process
- Identification of the conversion scenarios possible in the 1981 time frame
- Gathering and projection of key conversion data to 1981
- Estimation of total conversion costs and timetables

The following subsections describe each of these steps in the conversion study methodology.

2.5 WORKLOAD ELEMENTS IN THE CONVERSION PROCESS

As the first step in developing a workload scope for conversion, each element in the conversion process was defined. Each of these elements would become a project task in the statement of work for conversion and are eligible cost criteria for selection purposes. They are described in the following subsections.

2.5.1 Software

The key element in planning for conversion to another ADP system is software, impacted most heavily by the degree of compatibility between old and new ADP equipment. Software languages such as COBOL and FORTRAN under FIPS or ANSI standards can alleviate the conversion burden by retention of much of the original program code, although conflict between computer models always prevails in varying degrees. This conflict arises because of translation and interpretation differences between computers due to dissimilarities in operating system supervisors, data base access methods, and the amount of machine dependent logic imbedded in the program.

The use of non-standard or machine dependent programming languages such as Assembler, data base management, and retrieval software usually always requires a total rewrite of application software in languages acceptable to the new system and may not be eligible cost criteria for selection. Some data base management and retrieval software is operable on more than one ADP vendor product line; however, none of the packages utilized currently by EPA (System 2000, IRS, Easytrieve, etc.) operate on all major ADP vendor lines.

Applications currently utilizing these packages may require conversion to new packages or rewriting in COBOL or FORTRAN, depending upon the degree of compatibility in the selected ADP configuration. Workload for these conversion efforts will not be completely known until the new computer hardware is selected. Redesign and programming of existing systems may also be a required exercise where the new ADP system is incompatible in data base structures, file management capability, job stream management, and in programming languages and compiler extensions. This will involve restructuring existing systems, along with their inputs and outputs, and is a significant consideration in the work that is being addressed.

In order to understand the workload estimates for software conversion, consider the steps required for a contractor to convert a single job step program in a compatible conversion:

- Review pertinent documentation to identify what the program does and probable interfaces. Also review the job control language (JCL) to identify files required.
- List all changes required to the program (logic, internal filenames, etc.) and the associated JCL. Code and keypunch changes.
- Create new element in the source program file and the runstream file from the elements on the old system.
- Update the appropriate library elements and perform compilations.
- Locate the converted files required for this program and assure that they have passed file-to-file comparisons.
- Run the program on both the old and new systems.
- Compare the output listings between the two systems.
- If any card, tape, or disk files are created by this program, perform file-to-file comparisons between those output on the old system and those from the new system. This may require writing special one-shot programs to make the comparisons.

- Update all system and user program documentation associated with this program. This may include file descriptions and operating instructions. Detailed descriptions of all changes to the old system should be maintained in case of future problems.

- Organize all materials for turnover to the EPA person. Complete all administrative tasks.

- The EPA person must maintain receipt/status log, review all output listings and file-to-file comparisons, spot check data for accuracy, review all documentation including the detailed descriptions of actual changes, make appropriate comments and either accept or reject the submittal. If the turnover is rejected, many of the steps will have to be repeated.

Please note that there will probably have to be meetings with the contractor and EPA personnel from time to time which are also not accounted for.

2.5.2 Data Base

Data base conversion problems will not be completely known until the new computer hardware is chosen. Degrees of compatibility exist between vendor lines, but disk and tape file management and access methods usually vary to some extent, impacting the workload effort to convert. Usually the Request for Proposal (RFP) requires that the vendor provide the necessary data base conversion software and utility programs for loading files dumped from existing systems. Data base access methods and their inherent design differences between vendor product lines account for much of the workload in converting software written in standard COBOL and FORTRAN languages. The degree of this difference will dictate the complexity of data base and data access software conversion efforts.

2.5.3 Training

Conversion workload directly impacts all system users because of the need for training in the operating protocols of the new system command language (e.g., WYLBUR or ALPHA), system utilities, programming languages, data base management systems (e.g., replacements for System 2000 or IRS), job control language, system security conventions, and communications terminal support. Detailed programmer training in system architecture and operating system features is necessary to ensure that new systems are designed to efficiently execute on the new hardware.

For government operated system alternatives, additional training exercises are required for operations personnel in the management and operation of the new hardware and operating systems. Systems support staff (e.g., the STORET support group) would require training in redesigned or converted applications systems, new programming conventions, job control language, system utilities, and communications terminal support conventions. All of these training workload considerations will be dependent on the actual computer hardware selected and the degree of compatibility, if any, with the existing ADP equipment. The initial training, continued training courses, and user services functions will be provided under the proposed contract for ADP services and support.

2.5.4 Documentation

Prior to the start of the conversion process, all systems documentation will require updating in order to provide a starting point for actual conversion or redesign of all systems to be transferred to the new hardware. This ideally would be a planned long-term effort, culminating in the readiness of standardized documentation at the starting point of the conversion process. Accurate and up-to-date documentation would be a prerequisite for all machine dependent systems requiring total redesign and rewriting.

User documentation will require updating and rewriting in the areas of command language, communications terminal support, programming languages and conventions, job control language, and other user interface areas such as data management. Heavier user documentation changes will be necessary for those systems undergoing redesign for the new hardware.

Workload in the documentation area will be heavily impacted by the degree of compatibility in the new ADPE selection. Every change in timesharing service vendors will occasion some degree of change, if only because of differences in command language or operating systems between compatible hardware configurations. The impact of greatest workload will occur in those systems which, because of major architectural and operating system differences, cause the greatest number of application systems to be redesigned and reprogrammed.

2.5.5 Conversion Testing and Parallel Operation

Acceptance testing of converted or redesigned systems will be an important conversion planning factor. With software conversion being performed by either the hardware vendor or a software house, critical supervision and review of results will be key to the successful operation of application systems after conversion. Due to the considerable volume of software to be converted, testing may be scheduled over a length of time, proportionate to the degree of compatibility of the new system and attendant amounts of redesign incurred in the conversion effort. Conversion testing workload may impact users depending upon testing procedures during the parallel operation period before conversion testing is satisfactorily completed. The greatest impact of conversion testing will be on system managers who will be responsible for supervising the testing process. Once the testing of the converted system is completed, the converted system is put into production on the new facility and run in parallel with the old system. This permits the system manager to be assured of system backup during the initial production shakedown.

Again, the workload in this area will be in direct proportion to the degree of change in the software, directly relative to the differences in architecture in the new ADP system and that in the existing systems.

2.6 ALTERNATIVE CONVERSION SCENARIOS

The type of conversion process to be undertaken, i.e., with ADP systems that are either software compatible or non-compatible, has a heavy impact upon the entire conversion workload and timetable. In order to develop workload and timetable projections for each potential scenario, the following alternatives were considered:

- All compatible, or compatible to both WCC and NCC operations; a situation calling for the continued use of two hardware systems as at present
- WCC compatible, or a single operation compatible to WCC/COMNET but not compatible with NCC hardware
- NCC compatible, or the reverse of WCC compatible
- All non-compatible, or not compatible with either WCC or NCC hardware

The differences in conversion workload between the various scenarios are caused by the impact of redesign in converting to non-compatible equipment. Redesign is practically non-existent in a compatible conversion such as the current OSI/COMNET change. In this case all software and data base designs remain intact with conversion activities limited to retraining in the command language and operating concepts of the new system, transfer of programs and data bases, and acceptance testing.

The experience over the past several years at NCC provides an indication of why redesign is so much a part of conversion to a non-compatible system. The majority of the systems in this conversion from an IBM 360/50 to a Univac 1110 had to be redesigned due to differences in file management, job stream management, and system utilities. The following summarizes the major problem areas in several systems which had to be redesigned to operate with any degree of efficiency on the new system:

- Job control language differences in respect to specification of blocking factors, file devices, and concatenation of files. These aspects were not available in the Univac system and had to be programmed into the application software.

- Differences in compiler versions, extensions and capabilities. This caused a problem with the Univac ASCII COBOL and the conversion of variable blocked files and internal sorting.

- Differences in system utilities such as sorts, copies, dumps, reloads, etc., caused changes in the job stream and in some cases these operations had to be written into the application software.

- Lack of an indexed sequential file access method on the Univac system caused all files using this method to either be changed over to sequential, along with software changes, or to be held out of operation until the NCC staff could develop their own version.
- Differences in job control, system utilities and file management listed above, caused significant changes in job streams to the extent that all but the simplest systems had to be redesigned to provide the same capabilities and functions in the new system.

For purposes of comparison between compatible and non-compatible systems, Figure 2-1 summarizes the impact of conversion upon scenarios for compatible selections (IBM, Itel or Amdahl for Washington Computer Center systems and UNIVAC for NCC) and for all other vendor systems in the non-compatible category. A combination of compatible and non-compatible scenarios is also possible if a single service center replaces both WCC and NCC operations and the hardware is compatible to one of these current operations. In this case, either WCC or NCC conversion operations would be within the compatible scenario while the other would be in the non-compatible category. It should be noted that conversion workload will not be explicitly possible to predict without knowledge of the final hardware selection, since some are more or less compatible in data management structures and programming languages.

2.7 PROJECTING CONVERSION WORKLOAD, COSTS AND TIMETABLE

Projections to the 1981 conversion time period were based upon data collected in the survey of major EPA systems. Software conversion volume projections were developed from ADP activity survey forms and

CONVERSION IMPACT FOR COMPATIBLE AND NON-COMPATIBLE SCENARIOS

Conversion Element	Compatible Impact	Non-Compatible Impact
Application Software	Required for differences in command language, job control, communications handling, utilities, system macros and subroutines.	Architectural and operating system software differences will cause extensive redesign and rewrite of all systems not in compatible software languages or packages.
Data Base Management, Retrieval and Communications Software	Required for reimplementation and acceptance testing on the new system, or conversion to new package or rewrite if existing package is not supported.	If transferable, impact will be small. If not transferable, rewrite using new packages or conversion will be required.
Software Redesign	No impact.	Required for all systems with machine dependent design and for those with heavy workload efficiency requirements and non-compatible software languages or packages. Need complete documentation.
Data Base	Required for physical transfer and acceptance testing, possibly renaming and reorganization of files.	May require special conversion software to transfer and may impact software redesign if data management functions differ. Interface with regional and lab minicomputer systems.

Figure 2-1

Conversion Impact for Compatible and Non-Compatible Scenarios (continued)

Conversion Element	Compatible Impact	Non-Compatible Impact
Training	Required for differences in command language and communications protocol, possibly for job control, compiler versions, utilities, system macros and subroutines.	Required for differences in command language, job control, communications, programming design, programming languages, data management and retrieval packages, system utilities, data management and access methods, and for redesigned systems. Possibly for operations support if GOGO.
Documentation	User documentation changes for command language, communications, possibly job control.	Required for all systems to be converted or redesigned. Complete documentation including program system, utilities, job control, and job procedures will require total rewrite.
Conversion Testing	Required to prove operation of transferred software and data bases. Parallel operation and file-to-file comparisons will be required.	Required for acceptance of redesigned systems, redesigned or transferred data bases, new or transferred software packages, and for converted application software. Parallel operation and file-to-file comparisons will be required.

Figure 2-1 (continued)

from additional contact with ADP system managers. Data base volume projections were obtained from 1981 data in the Consolidated Systems Study of July 15, 1977. Additional conversion workload such as documentation, training and computer time were developed from an analysis of the total volume of systems and users subject to these conversion activities, projected to 1981 values.

Details on software volumes were available on a sampling of nine systems representing a cross section of systems in operation at WCC and NCC. These nine systems were STORET, SAROAD, PPIS, PCS, GICS, TSSMS, NEDS, Energy Data System, and ORD/OEMI Technology Assessment. After analysis of the remaining EPA systems not covered by the sample, it was determined that the systems in the sample represented approximately 25% of WCC systems and 20% of NCC systems. NCC had a lower sample factor due to a lower number of systems in the sample (4), and of these, many were relatively small in software volume.

Software conversion workload values were developed for the systems in the sample by applying workload standards from previous Informatics experience in similar conversion efforts. These workload standards were as follows for compatible and non-compatible conversion scenarios:

- Compatible Scenario. Contractor technical effort of 1/2 man-day for each single job step program (retrievals and outputs) and 2 man-days for each multiple job step program (update or scientific). EPA contract management and technical review effort of 0.1 man-day for single job step programs and 0.4 man-day for each multiple job step program. These standards assume completion of all software conversion activities including acceptance testing.

- Non-Compatible Scenario. Contractor technical effort of 15 man-days for redesign and rewrite of average size single job step program (100 to 500 lines of code) with a range of 5 to 30 man-days for smaller or larger programs. Multiple job step programs would require 30 man-days for average size programs (500-1,000 lines) with a smaller or larger range of 10 to 60 man-days. EPA contract management and technical review effort of 3 man-days (range 1 to 6) for single job step programs and 6 man-days (range 2 to 12) for multiple job step programs. These standards assume software redesign, programming, unit testing, systems testing, systems documentation, and acceptance testing activities for all software undergoing conversion to non-compatible hardware.

Timetable projections for converting systems in the sample were based upon contractor staff assignments of 15 to 20 personnel including management for each of the larger systems, and proportionately smaller size staffs for smaller, less complex systems. These staff sizes are considered optimum for project communications and management control, relative to the effort undertaken and the magnitude of the overall conversion task.

In utilizing the conversion workload estimates stated in this report, caution is advised since it is possible that these workload projections may be on the low side when the final target hardware is chosen. If the selected hardware is as non-compatible and dissimilar to existing WCC and/or NCC hardware as was the case in the IBM to Univac project at NCC, then workloads and timetables of double or more than those projected in this report are definitely within the realm of possibility.

SECTION 3

CURRENT CONVERSION WORKLOAD STATISTICS

3.1 INTRODUCTION

This section presents the current conversion workload statistics for existing activities, based upon current (1977) volumes for data bases, software, and users. The data was obtained from the survey described in Section 2, and from various reports from the OSI and NCC computer accounting systems. This data was supplemented by contact with system managers for additional information on conversion volumes and system plans for selected systems, and is summarized in Section 3.2. Section 3.3 discusses the conversion aspects of other service suppliers. Section 3.4 addresses further needs for additional data requirements, and Section 3.5 shows the current computer configurations at WCC and NCC.

3.2 CURRENT CONVERSION WORKLOAD STATISTICS TABLES

The current conversion workload statistics in Appendix A were developed in order to present the information collected on each activity impacting the conversion process. These form the baseline for projecting conversion workload for the 1981 EPA computer services acquisition cycle in Section 4. The tables contain existing systems that are either currently operating at COMNET or NCC, or are scheduled to be operational by 1981. As this data was gathered before the transition from OSI to COMNET was complete, data base volumes are based on OSI figures for those systems that were operating at OSI during the survey. Those activities supported by other suppliers are discussed in Section 3.3. The following subsections describe information contained in the Current Conversion Workload Statistics Tables, and how the tables are organized.

3.2.1 Organization

The workload statistics tables are grouped by EPA organization structure. All ADP activities for each office at the Assistant Administrator level are grouped together. For ORD, activities go one step further to include systems at each laboratory. Regional offices are listed at the end showing large ADP activities and totals for all national systems.

3.2.2 Table Data

The following data is included for each major ADP activity surveyed:

- FY 77 Annual Billing. The amount indicated for each activity represents the FY 1977 projected annual billing for operations for that activity. It is presented here in order to provide a measure of the scope and size of each activity.

- Software Type. Corresponds to the "Programming Language or Software Package" column in the tables in the Consolidated Systems Study. Indicates all languages and software packages utilized in the programming and operation of each ADP activity.

- Software Programs/Lines of Code. Indicates the number of programs utilized for each ADP activity and the number of program statements or lines of program coding embodied in the software.

- Data Base: Provides the volume of data base files necessary to convert. The number of tape reels used by each ADP activity was determined from the survey. Disk storage was calculated from OSI and NCC reports in conjunction with the survey and represents the average number of disk tracks occupied per month.

- Current System and Supplier. Indicates the computer facility on which the ADP activity is processed. WCC is used for the Washington Computer Center operation now operated by COMNET, on an IBM 370/168. NCC is for the National Computer Center at RTP, with UNIVAC 1110 hardware.

- Primary Users. Lists the total number of "hands-on" system users, such as programmers, terminal operators, data entry personnel, and managers, that would undergo retraining in the conversion process. "Use Mode" indicates "O" for online or demand processing, "B" for batch and remote batch processing. "User SW" is for custom software developed and used in conjunction with the current system supplier and the system data base by field operations (regions, labs) or by states and other non-EPA users.

- Plans and Interfaces. Includes plans and activity aspects which would impact the conversion process. This includes current status, future status changes (end of life cycle, operational date, etc.), interfaces with other activities.

3.2.3 Statistics Tables

The current conversion workload statistics were developed from the baseline activity survey forms and from personal contact. They present a summary of the items impacting the conversion process as currently seen. Software and data base volumes reflect values for 1977 and present a conversion workload baseline. ADP activities are grouped by each office at the AA level, with each region listed separately at the end.

3.3 OTHER SERVICE SUPPLIERS

This activity is outside the agency-supplied OSI (COMNET) and NCC facilities and is divided into three sections: the use of other governmental computers, the use of university computers, and the use by contractors of other suppliers. These areas are not expected to impact conversion workload since the use of these other suppliers is minor relative to the total EPA workload and it is not anticipated at this time that any significant portion of this activity will be converted to agency suppliers. Systems operating on other service suppliers therefore have not been included in conversion workload projections.

3.4 SUPPLEMENTING THE CURRENT CONVERSION DATA

The current conversion data contained in these statistical tables will require augmentation in several areas. The necessary additional information is of two types: coverage of additional ADP activities, and data which was not available in time for inclusion in this document.

- Additional ADP activities. For several ADP organizational areas, only a portion of the total workload has been covered by detailed surveys. Since MIDSD has undertaken a survey of the entire workload for each organization, much of this information could be used to augment existing conversion data. In addition, many surveys conducted by the contractor will be updated and corrected by system managers and users. These updates will then be reflected in the current conversion tables, as well as in the projected conversion workload tables in Section 4.

- Additional Conversion Data. The most serious deficiency in the current conversion data is in the area of software volumes: numbers of programs and lines of code for each programming language utilized in the activity. This information is required in order to properly assess the full impact of the software conversion workload and must be available to the system design concept contractors. For projection purposes, it is also important to obtain estimated growth of software volumes over the period from now until 1981. Additional considerations necessary for projecting conversion workload involve the degree to which existing software utilizes machine dependent coding, as in the use of COBOL extensions supported only by the incumbent vendor; data base access methods and updates to the systems interfaces listed in the charts in this section.

All additional data requirements listed above should be gathered to the greatest extent possible and included in the data provided to the system design concept contractors. A potential method of providing these data is a complete listing of each computer program and each data base file which must be considered for conversion.

3.5 WCC AND NCC COMPUTER CONFIGURATIONS

The current computer hardware configurations in operation at WCC and NCC facilities are shown in Figures 3-1 and 3-2. These two sites represent the bulk of the current workload handling capability for existing EPA systems which will need to be converted.

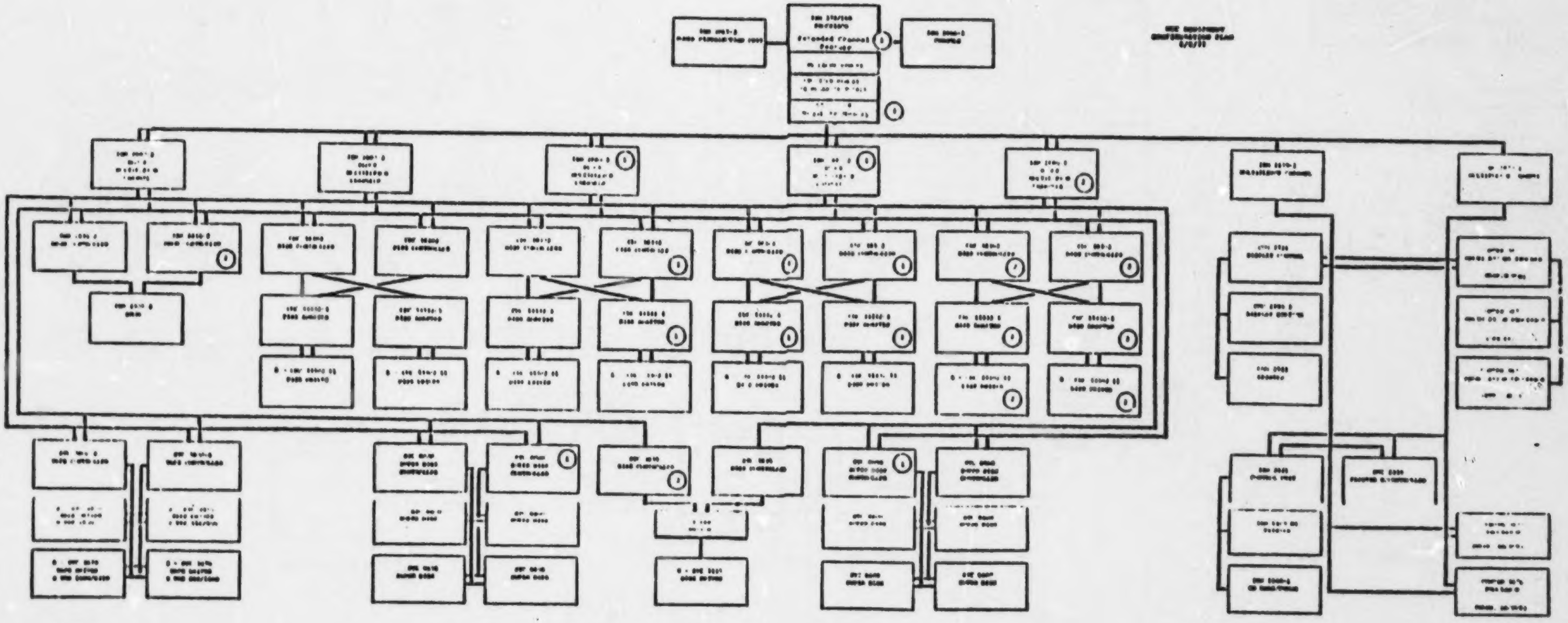
Extended Channel Feature

Figure 3-1. WCC Computer Configuration

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Reproduced from best available copy.

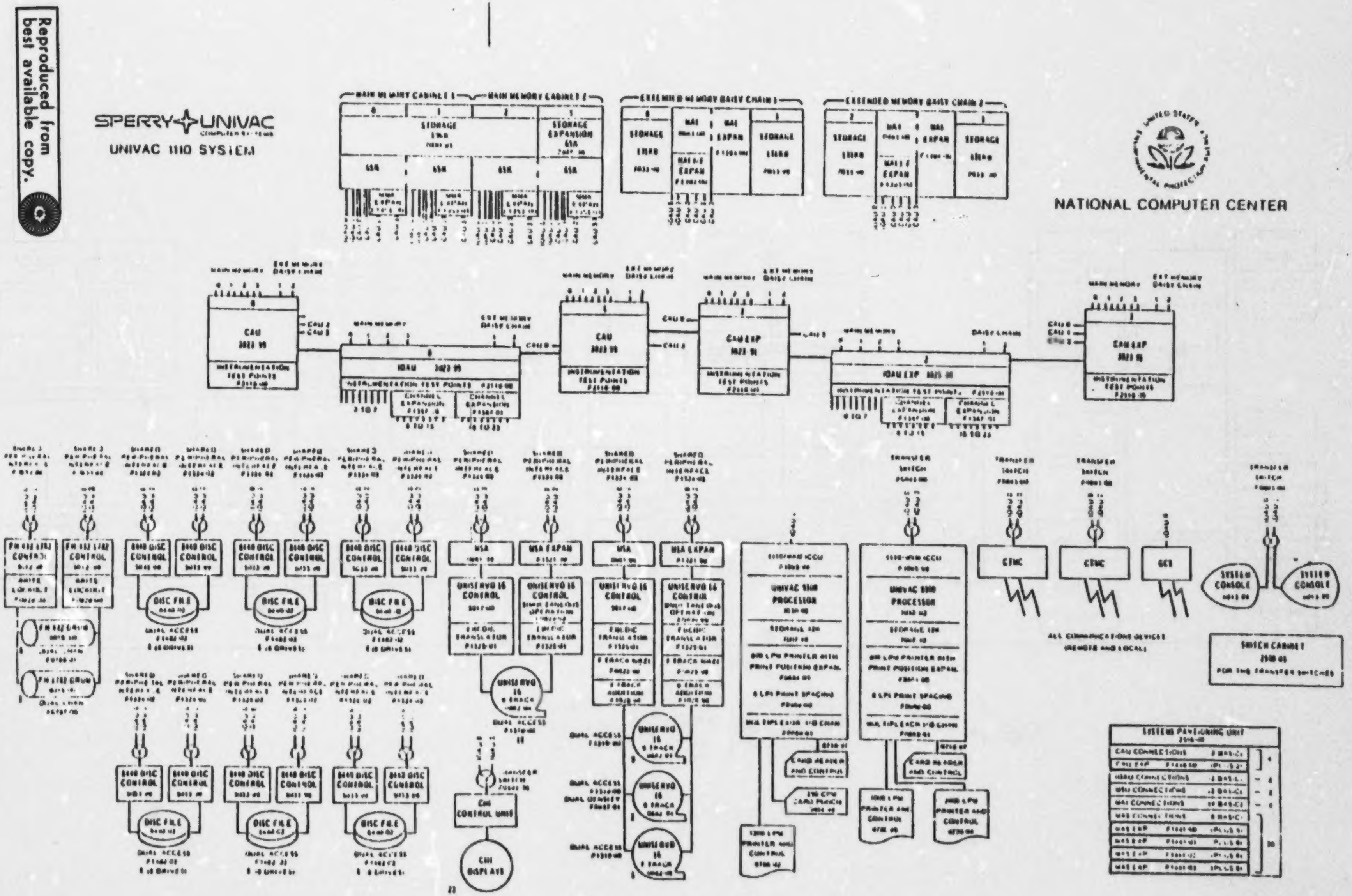
SPERRY UNIVAC
UNIVAC 1110 SYSTEM
NATIONAL COMPUTER CENTER
MAIN MEMORY CABINET 1
MAIN MEMORY CABINET 2
STORAGE
STORAGE EXPANSION
EXTENDED MEMORY DAISY CHAIN 1
EXTENDED MEMORY DAISY CHAIN 2
MAI
MAI EXPAN
MAIN MEMORY
EXT MEMORY DAISY CHAIN
CAU
CAU EXP
IOAU
IOAU EXP
INSTRUMENTATION TEST POINTS
CHANNEL EXPANSION
SHARED PERIPHERAL INTERFACE
TRANSFER SWITCH
FH-432 DRUM CONTROL
FH-432 DRUM
8440 DISC CONTROL
DISC FILE
DUAL ACCESS
WSA
WSA EXPAN
UNISERVO 16 CONTROL
UNISERVO 16
CRT CONTROL UNIT
CRT DISPLAYS
UNIVAC 1100 PROCESSOR
CARD READER AND CONTROL
PRINTER AND CONTROL
CTMC
GCS
SYSTEM CONSOLE
ALL COMMUNICATIONS DEVICES (REMOTE AND LOCAL)
SWITCH CABINET
SYSTEMS PARTITIONING UNIT

Figure 3-2. NCC Computer Configuration

SECTION 4

PROJECTED CONVERSION WORKLOAD

4.1 INTRODUCTION

Section 2, Projection Methodology, discussed the elements necessary to develop projected workload factors for the 1981 conversion time period and the process for applying these factors to individual ADP activities. Section 3, Current Conversion Workload Statistics, presented the factors and volumes impacting the conversion process as they exist today. This section presents the projected volumes for conversion, for the 1981 time period when conversion to new ADP equipment is planned. Each ADP system activity surveyed is projected and major impact areas in the conversion process are indicated for compatible and non-compatible conversion scenarios. Projections for data base volumes are based upon the projection methodology and statistics presented in the Consolidated Systems Study document, which considers that EPA and national programs will remain on their present course with reasonable growth for the agency. Projections for software volumes, software characteristics, and users were obtained during the ADP activity survey and from supplemental contact with system managers. Projected conversion workload volumes and characteristics are summarized in Section 4.2. Section 4.3 discusses detailed conversion workload values for selected major systems and total projected software conversion costs. Section 4.4 addresses several overall conversion planning considerations and associated costs.

4.2 PROJECTED CONVERSION WORKLOAD TABLES

The projected conversion workload for 1981 tables presented in Appendix B were developed in order to summarize the projected volumes of activity impacting the conversion process in 1981, and to show major areas of conversion workload impact for compatible and non-compatible system scenarios. These tables were derived from Projected Workload Data for 1981 tables in Appendix B of the Consolidated Systems Study (draft) document, and from additional information gathered from the ADP activity survey forms and from personal contact. Major conversion impact area information for compatible and non-compatible system scenarios was developed by reviewing the conversion elements and characteristics of each system and relating these to the attributes of each scenario, as presented in Section 2.

The tables contain systems currently under development or in operation that are projected to be in operation in 1981. The following subsections describe information contained in the tables and how the tables are organized.

4.2.1 Table Organization

The projected conversion workload tables are grouped by EPA organizational structure. All ADP activities for each office at the Assistant Administrator level are grouped together. ORD activities are additionally listed to include systems at each laboratory. Regional offices are listed at the end with individual regional systems and a separate grouping of all national systems for each region. National systems in use at each region were grouped together in order to avoid duplication of the software conversion workload specified under each national system heading. The regional data base conversion workload and other unique regional conversion considerations are listed separately by region.

4.2.2 Table Data

The following data is listed for each major activity area surveyed and projected for 1981 values:

- Annual Billing: Projections for the projected workload tables were obtained from Appendix B of the Consolidated Systems Study document. It is presented here in order to provide a measure of the scope and size of each ADP activity.
- Software: Type of application programming languages and software packages currently used and planned for use by 1981. Number of programs and lines of code are selectively listed where these were possible to be obtained, for purposes of indicating size and scope of the software conversion effort. Software volumes were projected to 1981, based on survey planning information.
- Data Base: Provides the volume of data base files necessary to be converted, based upon projected data base (storage) volumes in Appendix B of the Consolidated Systems Study document. Provides number of tape reels and disk storage tracks utilized for each system for master files and working storage.
- System Supplier: Indicates the computer facility on which the ADP activity is processed, relative to the 1981 time period. WCC is used for the Washington Computer Center operated by COMNET on an IBM 370/168. NCC is the National Computer Center at RTP, utilizing a UNIVAC 1110 System.

- Primary Users: Under "Number" and "Location," lists the impact on retraining for conversion showing the number (where possible to obtain) of system users, programmers, terminal operators, data entry, and management personnel directly impacted by conversion to a new system. Location indicates the geographic spread of personnel requiring retraining. "Use Mode" indicates "O" for online or demand operation and "B" for batch and remote batch processing. Systems emphasizing either batch or online operation are underlined under the "O" or "B". "User SW" indicates custom software developed and used in conjunction with the system supplier (WCC or NCC) and the system data base by field operations (regions or labs) or by states and other non-EPA users.

- Compatible System - Major Impact Areas: Lists the major areas for each ADP activity which impact conversion workload under the compatible system conversion scenario. Considerations for software mixtures and complexities, interfaces with other systems and minicomputers, large data base conversion volumes, data base organization, field user retraining, software with imbedded machine dependent logic, are listed where appropriate for each system. As in the COMNET conversion, transfers of operations between compatible hardware results in changing of command language, operations protocol, job control, and in some cases software. Potential conversion problem areas are highlighted by those major impact areas listed here.

- Non-Compatible System - Major Impact Areas: Lists the major conversion workload impact areas for each ADP activity, under the non-compatible system conversion scenario. This scenario considers that ADP equipment is selected which is not software compatible (i.e., software must be redesigned and reprogrammed) with regard to the hardware and associated operating system currently utilized for each ADP activity. It should be noted that if a "compatible" ADP system is selected for both WCC and NCC operations, either WCC or NCC ADP activities will fall under the non-compatible scenario (e.g., if Univac equipment were selected for both WCC and NCC activites, then all WCC activities would be in the non-compatible category and all NCC activities would fall under the compatible scneario). Major impact areas under this scenario include programming languages other than COBOL/FORTRAN, hardware oriented software packages, large data base conversion volumes, hardware dependent data base organization, and job stream complexity. These are in addition to those major impact areas listed under the compatible scenario.

4.2.3 Projected Workload Tables

The tables in Appendix B were developed from workload projections in the Consolidated System Study document, from the ADP activity survey, from contact with system managers, and from analysis of the design and operating characteristics of each ADP activity. They present a summary of the elements most heavily impacting conversion workload in 1981. ADP activities are grouped by each office at the AA level, with regions listed separately at the end.

4.3 CONVERSION WORKLOAD VALUES FOR SELECTED SYSTEMS

Several ADP activities for which projected conversion workload values are available have been selected for analysis and presentation in this section. These activities represent some of the larger systems in operation and are useful for consideration in planning the conversion process for all ADP activities in 1981. Figure 4-1 lists these activities and indicates manpower workload and minimum elapsed time estimates for converting the software of each under compatible and non-compatible system conversion scenarios. The rationale for these workload estimates and a discussion of total cost projections follow.

ADP ACTIVITY	COMPATIBLE SYSTEM CONVERSION CONTRACTOR MAN/DAYS	EPA MAN/DAYS	MIN. TIME MONTHS	NON-COMPATIBLE SYSTEM CONVERSION CONTRACTOR MAN/DAYS	EPA MAN/DAYS	MIN. TIME MONTHS	COMMENTS AND ASSUMPTIONS
TSSMS	23	5	1	570*	114	3	*34 programs, 30 are in IRS; could be reduced 75% if IRS converted.
GICS	260	52	3	2650*	530*	9	*Most programs average less than 50 lines each. Could be reduced 85% if present retrieval programs (500) stayed on IRS, and IRS converted.
PCS	100	20	2	2400	480	8	
PPIS	155	31	2	4200	840	14	Assumes 140 programs including regional software and 20 of these are complex/update type.
STORET	285	57	3	8400	1680	28	270 total programs including regional software and 100 of these are complex or update type. Assumes system is documented before conversion.
SAROAD	155	31	2	4100	820	14	140 COBOL programs; 15 in S2K. Assumes 50 are complex or update type.
NEDS	74	15	1	2140	428	8	87 COBOL programs; assumes 20 are complex type.
ENERGY DATA SYS.	11	2	1	240	48	3	13 programs including 3 complex/update type.
OEMI-HQ TECH. ASSESS.	45	9	1	1200	240	6	45 programs including 15 complex/update type, mostly Fortran. Average size for complex programs: 3000-4000 lines of code.
TOTALS:	1108	222		25900	5180		

Figure 4-1. Software Conversion Workload Values for Selected Systems

4.3.1 Rationale for Software Conversion Projections

Computation of workload values for software conversion in Figure 4-1 is based upon the following methodology and standards. Sources for these standards are various Informatics divisions with prior experience in converting software of similar types on both compatible and non-compatible hardware. The standards presented are averages of past experience and cannot be finitely predicted until the new hardware is known. Experiences in the IBM to Univac conversion at NCC show workload figures that are double the estimates listed here. It is considered that the experiences of the Univac conversion were in the high range of most conversion workload efforts, in comparison to similar projects in the Informatics experience. However, caution is advised since it is possible that the average conversion workload figures stated in this report and used for projecting workload may be on the low side when the final target hardware is chosen. If the selected hardware is as non-compatible and dissimilar to existing WCC and/or NCC hardware as was the case in the IBM to Univac project, then workloads of double or more than those projected in this report are definitely within the realm of possibility.

4.3.2 Compatible Scenario

Assumes same type hardware, same operating system and compiler versions, a different command language and differences in operating conventions and standards (similar to the OSI/COMNET change). The following standard workload factors are based upon contractor performance of all technical effort, with contract management and technical review by EPA personnel.

- Contractor (including management):

    - Single job step (retrieval/output) programs: 1/2 man-day for each program, including acceptance testing.

    - Multiple job step (scientific, update, or other complex type) programs: 2 man-days for each program, including acceptance testing.

- EPA contract management and technical review:

    - Single job step programs: 0.1 man-days per program, including acceptance testing.

    - Multiple job step programs: 0.4 man-days per program, including acceptance testing.

- Minimum time (represents the minimum elapsed calender time to complete conversion of all programs in a system including system familiarity, software conversion, and acceptance testing):

    - Maximum man loading of 15-20 analyst/programmers per system, including management. Smaller systems would be staffed with proportionately smaller man loadings, so as to maximize efficiency and control.

    - Minimum of one month to complete each system, allowing sufficient time for system familiarity and acceptance testing.

    - Average of 20 working days per month, allowing for holidays and other non-productive time.

    - Sufficient contractor staff is assigned to provide continuity of effort. Variations in staff levels and contention problems with other parallel conversion activities will directly impact the elapsed calender time to complete each system.

It should be noted that program sizes are not a factor in compatible system conversion efforts, since program code remains in its original source state. Primary efforts in compatible conversions involve changes in job control, file names and structures, job stream organization, system utilities, security, file access methods, use of system macros and subroutines, and spooling (e.g., HASP) conventions.

4.3.3 Non-Compatible Scenario

This scenario assumes that all systems will be subjected to redesign and rewrite due to differences in operating system, file access methods, job stream management, system utilities, system macros and subroutines, compiler versions and extensions, job control language, and command language. Further assumptions are that portions of existing ANSI-COBOL/FORTRAN programs are reusable in their original form, most commonly in the internal processing routines which are less machine and operating system dependent. FORTRAN is usually a more standard and machine independent language, except in file handling routines which cause frequent use of compiler extensions.

The following workload standards are based upon contractor performance of the technical effort, with associated EPA contract management and technical review personnel. Efforts involved in the technical spectrum include system redesign, programming, unit testing, systems testing, systems documentation, and acceptance testing.

- Contractor (including management):

    - Single job step (retrieval/output) programs of an average size between 100 and 500 lines of code: 15 man-days per program (smaller or larger average size programs or more complex programs could range from a low of 5 man-days to a high of 30 man-days).

    - Multiple job step (scientific update, or other complex type) programs of an average size between 500 and 1000 lines of code: 30 man-days per program (smaller or larger size programs or more complex programs could range from a low of 10 man-days to a high of 60 man-days).

- EPA contract management and technical review:

    - Single job step programs: 3 man-days per program for average size programs (range 1 to 6 man-days).

    - Multiple job step programs: 6 man-days per program for average size programs (range 2 to 12 man-days depending upon size and complexity).

- Minimum time: represents the minimum elapsed calendar time to complete the redesign and rewrite effort, including system design, programming, unit testing, systems testing, system documentation, and acceptance testing. The following standards apply:

    - Maximum of 15-20 analyst/programmers per system, including management. Staff sizes would be optimized in accord with system size and workload in order to promote maximum efficiency and management control.

    - Minimum of 3 months to complete each system, allowing for gaining system familiarity and for acceptance testing.

- Average of 20 working days per month, allowing for holidays and other non-productive time.

- Sufficient contractor staff is applied to provide continuous support to the effort (variations in this factor and contention with other conversion projects will directly impact calender time to complete).

4.4 SOFTWARE CONVERSION COST PROJECTIONS

Projections of software conversion costs are based upon a nine system sample as described in Section 2. The nine systems were STORET, PPIS, PCS, GICS, and ORD/OEMI Technology Assessment under WCC operations, and NCC operations were represented by SAROAD, NEDS, EDS, and TSSMS. WCC systems in the sample were estimated to represent 25% of the total for all WCC systems; NCC systems in the sample were estimated at 20% of the NCC total.

Using the man-days listed for software conversion in Figure 4-14, the following software conversion costs can be derived using $4000 per man-month for the compatible scenario and $5000 per man-month for the more demanding activities in the non-compatible scenario.

	Scenarios			
	All Compatible	WCC Compatible	NCC Comptaible	All Non-Comptaible
STORET (WCC)	$57,000	$ 57,000	$2,100,000	$2,100,000
PPIS (WCC)	31,000	31,000	1,050,000	1,050,000
PCS (WCC)	20,000	20,000	600,000	600,000
GICS (WCC)	52,000	52,000	662,500	662,500
OEMI T/A (WCC)	9,000	9,000	300,000	300,000
SAROAD (NCC)	31,000	1,025,000	31,000	1,025,000
NEDS (NCC)	14,800	535,000	14,800	535,000
EDS (NCC)	2,200	60,000	2,200	60,000
TSSMS (NCC)	4,600	142,500	4,600	142,500
WCC TOTAL	$169,000	$ 169,000	$ 4,712,500	$ 4,712,500
NCC TOTAL	52,600	1,762,500	52,600	1,762,500
*EPA TOTAL	$939,000	$9,488,500	$19,113,000	$27,662,500

*The totals for EPA are the sum of WCC totals X 4 and NCC totals X 5, representing 25% and 20% of the total for each computer center.

The software conversion costs projected above represent manpower costs only and do not include provision for machine time, data base conversion, retraining, and user documentation. These areas are addressed in the following subsection.

4.5 ADDITIONAL CONVERSION COST AREAS

Further conversion cost areas beyond those considered in the preceding software conversion section include provision for machine time in software conversion testing, data base conversion, redesign and conversion of data base management software packages, training, and user documentation. These additional cost areas are estimated in the following subsections and represent "average" conversion situations for both compatible and non-compatible scenarios. It should be noted that these estimates may fluctuate widely depending upon the degree of change from existing WCC/NCC hardware and the new equipment. Hardware as divergent as in the case of the IBM to Univac conversion at NCC could represent an increase of as much as 100% over the projections listed below for less widely disparate hardware relationships.

- Machine Time for Software Conversion: Allowance for machine time in software conversion efforts is usually included in hardware lease costs when being bid by the hardware vendor. However, in the case where an independent software house is providing the software conversion service, this may result in additional costs unless the hardware utilized is purchased or leased and is in place and available for use. Usually, however, the conversion process begins long before the leased or purchased hardware arrives, thereby resulting in additional front-end software conversion costs. In the case of a service center operation such as that provided by COMNET, machine time costs for conversion may be imbedded in total system charges but they remain an item impacting the overall system charge schedule. Computer resource costs will be incurred on both old and new systems during the parallel testing phase.

Considering the software conversion workload values projected in Section 4.3, an estimated 500 resource hours of machine time would be required for the compatible conversion scenario, primarily for acceptance testing and parallel operation. Non-compatible conversion would require significantly greater machine workload for unit testing, systems testing, and acceptance testing, and would entail an estimated 10,000 resource hours of machine time for all EPA systems. WCC compatible conversion would require 3700 hours and NCC compatible conversion would utilize an estimated 6800 resource hours.

- Data Base Conversion: Factors involved in conversion of data base files under the compatible scenario would include physical transfer, dumping and reloading, and possible renaming and reorganization of files depending upon operating conventions of the new system. Non-compatible data base conversion is highly dependent upon the differences in file management characteristics between old and new systems. Worst case changes could involve restructuring of all non-sequential disk files. Sequential disk files and tape files would require more minor changes to file names and blocking factors and possible word length adjustment and code translation of data elements. Special software would be required for non-compatible data base translation and reloading into restructured file organizations.

  Compatible scenario data base conversion would involve an estimated five man-months of conversion activity or approximately $20,000 (at $4000 per man-month). Machine time requirements for dumping, reloading and acceptance testing (file to file comparisons) would involve an estimated 300 resource hours. Non-compatible scenario data base conversion would involve an estimated 125 man-months or $625,000 (at $5000 per man-month). Machine time for dumping, conversion processing, reloading, and acceptance testing would require an estimated 7500 resource hours for all EPA systems. WCC compatible conversion would require $200,000 personnel time and 2700 computer resource hours; NCC compatible conversion is estimated at $420,000 and 5100 computer hours.

- Conversion of Data Base Management Software: Conversion of IRS and S2K software packages to non-compatible hardware, i.e., other than IBM compatible or Univac hardware, should be a serious consideration, since over 35 major EPA systems use these packages. Conversion of statistical packages may also be cost-beneficial for use in ORD areas. IRS and S2K conversion is not a consideration for compatible scenario conversion, since both IBM and Univac equipment scenario conversion, since both sions of these packages. Conversion of IRS to a non-compatible ADP system would involve $100,000 to $150,000 for redesign and rewrite of the 30,000 lines of code. Six to eight calendar months would be required, according to Sigma Data Corporation. S2K would be approximately twice as much due to its greater size and complexity.

- User Training: Retraining effort for the compatible scenario would be limited to job control, command language, operating conventions, and programming support. Out-of-pocket expense items would be required only in minimal areas involving programmers, terminal operators, and others with "hands on" system usage functions. This retraining effort could be covered over a six to nine month conversion period by the contractor. In the case of ADP activities with support staffs, EPA personnel could provide applications training, once they themselves had completed training by the hardware or service vendor. An estimated 10 man-months of vendor support would be required for this activity, or $50,000 (at $4,000 per man-month). Impact on EPA personnel undergoing or providing retraining services would involve an estimated 250 man-months of equivalent productive time. Non-compatible scenario retraining would be much more intensive due to extensive redesign of all software and more extreme differences in programming design and support. Retraining of system support staff, where it exists for large systems such as STORET, who in turn could retrain system users would greatly assist this potentially large effort. Training functions for the majority of EPA systems, however, would require contract services for training, particularly in areas involving new computer system methods. An estimated 250 man-months of vendor support would be required for non-compatible conversion, amounting to $1,250,000 (at $5,000 per man-month) for all EPA systems. EPA personnel impact for retraining purposes under this scenario would involve an estimated 1,000 man-months of equivalent productive time. The WCC compatible conversion scenario would require approximately $450,000 and the NCC compatible conversion $850,000 for retraining support.

- User Documentation: Compatible conversion would require changes in command language, job control, programming standards and conventions, compiler and utility support versions, and other basic data in user guide documentation. This effort would entail an estimated 25 man-months, or $125,000 (at $5,000 per man-month) for changes to all system user documentation if such services were performed contractually. Non-compatible scenario documentation changes would be more severely impacted by extensive system redesign in addition to those changes in the compatible scenario. All documentation would require a total rewrite, involving an estimated 250 man-months, or $1,250,000 (at $5,000 per man-month) for all EPA systems. WCC compatible conversion would involve approximately $500,000 and NCC compatible conversion $875,000.

4.6 TIMETABLE FOR CONVERSION

The timetable for conversion to new ADP equipment is one of the prime areas for management consideration, in relation to the costs of conversion and impact of conversion on program operations. An excessively long conversion timetable is not only costly, but disruptive to ongoing programs and development of new projects. Conversion timetable projections are impacted differently, depending upon the conversion scenario selected. Each scenario is examined below:

- Compatible Conversion Scenario: Selection of a single vendor for both WCC and NCC operations would result in only a partially compatible system conversion, since either WCC or NCC systems would have to be converted to a non-compatible system. Given this assumption, either WCC or NCC systems would be subject to a similar type of conversion as currently experienced in the OSI to COMNET conversion. The OSI/COMNET conversion effort is scheduled for an eight month timetable. Current experience indicates that this would be a minimum timetable for conversion in 1980-81, considering the greater volume of ADP activity projected for that timeframe. The resource factor, both on the part of the conversion contractor staff and in the ability of agency personnel to absorb change, is a consideration in the rate systems can be converted. Acceptance testing and proving of system operations before actual operations begin cannot be over-emphasized in planning future conversion efforts. All factors considered, prudent planning would indicate a conversion effort over a twelve month period for a compatible scenario similar to the OSI/COMNET conversion, projected for 1980-81 workload volumes for either WCC or NCC operations.

- Non-Compatible Conversion Scenario: The timetable for conversion to non-compatible hardware must be examined from two sides. One involves the other half of the compatible conversion at either WCC or NCC operations. The other considers that neither WCC or NCC operations would involve a compatible conversion. The resource factor, in conversion contractor staffing and in EPA project control, is a serious consideration in this scenario with the considerable workload projected for systems redesign activities. A phased approach which minimizes resource contention and overlap among parallel conversion efforts is recommended. This lengthens the total conversion schedule but reduces conversion impact on individual systems and associated program efforts. Considering an optimized balance of resources and a phased conversion schedule, a timetable of two years (starting from the point of conversion vendor selection) for the majority of EPA systems is possible, with some of the larger systems (STORET, SAROAD, PPIS, etc.) extending the overall conversion schedule to three years. The same timetable could be maintained for a totally non-compatible scenario as for a partial one by increasing the conversion resources applied, i.e., at both WCC and NCC. The impact on both contractor and EPA resources would of course be greater for a simultaneous non-compatible conversion at both NCC and WCC, since more conversion operations and management contention problems would result. However, with adequate planning and conversion contracting to either a single high resource firm or to multiple vendors, the three year timetable could be maintained.

On-going operation and development of existing systems during a conversion period of two to three years will require the continuation of WCC/NCC services beyond the 1981 period when the WCC/NCC contract expires. Considering a start-up of conversion activities in 1981, this requirement will extend to 1982 or 1984, depending on the length of the conversion period and degree of compatibility to existing hardware.

SECTION 5

CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

The magnitude of the conversion effort as presented in Section 4 indicates a heavy concentration of resources will be required during the 1981-1982 time period, and possibly beyond for some of the larger ADP activities. Clearly, adequate preparations will be required for the conversion effort, beginning with a complete inventory of software and data base structures. Control must also be exercised over current and future development efforts to restrict the use of programming languages and machine dependent coding that impacts the conversion effort. Planning for conversion must consider the timetable for procurement and selection of hardware or services, and must reflect the predicted schedule for conversion under both compatible and non-compatible system scenarios. Federal regulations dictating conversion activities and cost evaluation must be delineated and factored into the overall conversion planning process. The following subsections address each of these major conversion issues.

5.2 PREPARATION FOR CONVERSION

Preparations for the conversion should begin as soon as possible and all future development efforts should be designed with eventual conversion workload clearly in mind. Several key items for preparation of the conversion effort are in software and data base areas, and need to be undertaken by the systems design contractor in order to establish the impact of conversion using their design concepts.

RECOMMENDATIONS:

- Software Classification and Inventory: A key item required for vendor analysis and costing of the software conversion process. The following information is required to be collected and documented for every EPA system to be converted to new ADP equipment:
  - Total number of programs by programming language (including compiler version) or software package.
  - Total lines of program statements or code by programming language or software package.
  - Projected growth of software (%) by 1981.
  - Total number of programs and lines of code used in a single job step processing environment (retrieval and output programs).
  - Total number of programs and lines of code used in a multiple job step processing environment (update, scientific, modeling, etc.).
  - List of compiler extensions, system macros and subroutines, and system utilities employed in the system and the number of associated programs and jobs utilizing these features.

This inventory list should be gathered and documented for all EPA systems by the time the RFP is released to vendors. EPA will be responsible for this effort which must be provided to the design contractors to enable vendor analysis. They will find most of the information in the program libraries of WCC and NCC operations.

- Data Base Classification Inventory: Required to enable vendor analysis and costing. The following information is required for every EPA system to be converted to new ADP equipment:

- Total number of files by tape or disk residency.
- File access methods (sequential, indexed sequential, direct, etc.) and associated number of files and tape reels or disk tracks using each type of file access method.
- File security requirements by number of files.

This inventory list should be gathered and documented for all EPA systems by the time the RFP is released. EPA will make it available to design contractors. The EPA contractor could perform this effort and should find all pertinent information within the data base libraries of WCC and NCC operations.

- System Documentation: Accurate and current system documentation is necessary for both compatible and non-compatible conversion scenarios and can have a considerable impact on the overall conversion schedule. Compatible scenario conversion efforts are assisted by the availability of job stream flow documentation and the identification of the total components of each system. Non-compatible scenario conversion efforts require documentation to provide a base point for system design and a definition of the operating requirements from which a redesigned job flow can be developed. Each EPA system to be converted will require documentation to the standards set forth in the EPA ADP Standards Manual and must further be maintained in a current status during the conversion process.
- Restrictions on Use of Non-Standard Software: Considering the considerable impact that software usage has in the degree of compatibility with new ADP hardware, the use of programming languages other than FIPS or ANSI should be heavily restricted in future system development efforts. Use of machine or vendor dependent extensions to these programming languages should be used only where cost effectiveness can be justified in comparisons of operating efficiency and future conversion workload. Data base

management and statistical software that is widely used, such as IRS, S2K, SPSS, etc., may prove to be cost beneficial to rewrite for the new hardware, considering the great extent to which these packages are currently utilized. Other packages not commercially available for at least two different manufacturers' central processing hardware should be restricted and subject to cost effectiveness analysis before being utilized in the development of new software. Conversion of these packages to the more commonly utilized packages should be encouraged over the interim period before the next conversion cycle.

- Update and maintain inventory of system interfaces for potential future use in redesign activities.
- Plan to convert IRS, S2000, and heavily used statistical packages such as SPSS, to the new equipment. Conversion of these packages should be cost effective compared to rewrite of the 50 or more systems using them.
- Negotiate a contract extension option with WCC/NCC for the possibility of a non-compatible selection for WCC or NCC operations. This option would allow EPA to continue with WCC/NCC until 1982 or 1984 and would allow the continuation of operation on all systems through the conversion period.

In summary, conversion preparations should be planned over the short term for completion of software and data base inventories for inclusion in the RFP. Longer term efforts leading up to the start of conversion in 1981 require the updating and maintenance of systems documentation and future restrictions in the use of non-standard software packages and compilers and in the use of vendor dependent compiler extensions and subroutines. Non-EPA users such as states should be kept abreast of these plans so they can schedule and make plans accordingly.

5.3 FEDERAL REGULATIONS AND CONVERSION

Federal regulations governing the procurement and evaluation of conversion services are most prevalent in FMC 74-5, several House Reports, and in several EPA, GAO and GSA guidelines. OMB A-76 concerns the need for vendor contracting for products and services such as the technical aspects involved in the conversion process. OMB A-109 provides guidelines for an initial survey of requirements (covered by this ADP Study), a systems design phase, and a final phase to prepare a hardware/services RFP and select the winning vendor. The detailed impact of conversion is prepared during the systems design phase.

5.3.1 Conversion Cost Criteria

Under current EPA guidelines, the following criteria determine what is to be included in the cost of conversion for contractor selection:

- Application programs shall be based on the use of Federal Standard (FIPS) or American National Standard (ANSI) languages; or, on the use of software packages which are commercially available from at least two different manufacturers' central processing hardware.
- Redesign will be based upon the need to change systems design to maintain or improve operational efficiency and throughput rates on the new equipment. Basic design specifications for such systems must have been stable for at least two years.
- Programs must have an economic life of at least two years from the date of conversion.
- Programs must be operational on the existing computer at the time the Delegation of Procurement Authority (DPA) is granted

- Programs must have adequate systems documentation. Vendors will not be liable for conversion of programs for which there is not adequate documentation.

- Specific volumes of conversion will be stated. Vendors will not be liable for conversion above the stated volumes.

Considering the various Federal guidelines, the relationships between the EPA conversion and Federal Regulations and Policy are shown in Figure 5-1.

Federal Policy/Regulation	EPA Conversion Approach
Programs in high level language (Recommendation 12, House Report 4-1746).	All programs for cost evaluation are in FIPS or ANSI high level languages or software packages currently operable on two or more vendors' hardware.
Conversion costs be direct out-of-pocket costs when evaluating equipment for conversion proposals (Recommendation 13, House Report 94-1746).	Only contract costs proposed by vendor for ADP systems and conversion are considered (total of both provides lowest cost determination).
Economic life of programs to be converted (FMC 74-5).	Only programs with an economic life equal to two years or more be included in cost evaluation for selection purposes.
Redesigning instead of converting considerations - (FMC 74-5).	Redesign will be the preferred method where appropriate for needs to upgrade design for maintenance or improvement of operational efficiency.
Delineating conversion costs in solicitation document (FMC 74-5).	Use of a separate conversion portion of the RFP which clearly identifies rules by which conversion costs will be evaluated for selection purposes. (See Section 5.3.1 for conversion cost criteria).

Figure 5-1. Conversion Cost Guidelines

The EPA conversion procurement approach outlined above meets the necessary requirements of Federal policy and regulations as indicated yet opens competition to service equipment and software vendors, which can combine to meet EPA requirements in a prime contractor environment.

5.4 DISTRIBUTED PROCESSING

Additional impact upon the 1981 conversion workload will be occasioned by the current move to minicomputers and distributed processing in the regions, laboratories, and in some areas of EPA headquarters. Predictions are that certain laboratory systems will remove all·timesharing workload from future consideration. Business applications may displace up to 80% of the current timesharing workload at headquarters for certain administrative functions. However, minicomputers and distributed processing concepts are being targeted more frequently to preprocessing input data, with access to large shared data bases continuing in an upward curve. Accordingly, distributed processing may reduce some of the input screening functions now imbedded in the timesharing workload, but trends indicate that this reduction will be more than offset by increased access and utilization of data bases available at a common centralized site. Conversion workload projections therefore are affected in only a limited way by the move to distributed processing, primarily in the laboratories and R&D areas.

APPENDIX A

CURRENT CONVERSION WORKLOAD STATISTICS

CURRENT CONVERSION WORKLOAD STATISTICS

ORGANIZATION ADP ACTIVITY	FY '77 BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			PLANS AND INTERFACES
		TYPE	PROGS. LINES	TAPE REELS	DISK TRACKS		NO. LOC.	USE MODE	USER SW	
OFFICE OF PLANNING AND MANAGEMENT (OPM) Office of Administration (OA)										
Gen. Admin. Supt	59.8	IRS (60%) COBOL PL/1 FORTRAN		5	2535	WCC	HW	O/B	-	PDP 11/70 requested for portion of system.
Gen. Res. Supt.	47.6 48.0	FORTRAN		3 3	5000 5000	WCC NCC	HQ Labs.	O/B	-	
Library System	21.0	IRS		-	741	WCC	HQ	O/B	-	PDP 11/70 plans for portion.
PPS (Personal Prop.)	52.0	COBOL IRS		1	2755	WCC	HQ Regs Labs	O/B		FMS interface in future.
CIS (Contracts Inf.)	112.0	COBOL IRS		3	761	WCC	HQ	O/B	-	
TSSMS	36.0	IRS COBOL	22 progs 3 progs	8	1262	WCC	3 HQ	O/B	-	Moving to NCC mid-1977; 30% software growth by 1981.
HMIS (DIPS)	94.3	PL/1 IRS COBOL		24	2700	WCC USGS	HQ Reg. Labs	O/B		
Other OA	459.2 1252.6				10417 90361	WCC NCC		O/B		

CURRENT CONVERSION WORKLOAD STATISTICS

ORGANIZATION ADP ACTIVITY	FY '77 BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			PLANS AND INTERFACES
		TYPE	PROGS. LINES	TAPE REELS	DISK TRACKS		NO. . LOC.	USE MODE	USER SW	
Office of Planning and Evaluation										
Other OPE	21.8 7.5				911 159	WCC NCC		O/B		
Office of Resource Management										
RMIS	85.0	IRS COBOL		--	2588	WCC	HQ	O/B	-	
FRS	32.2	IRS (50%) FORTRAN PL/1 COBOL		18	2500	WCC	HQ Reg.	O/B		Regional mini interfaces planned, interfaces KDS, DIPS, GICS, FMS.
FMS	276.0	COBOL IRS ASSEM.		500	15000	RCC	HQ Reg. Labs	B		May convert to WCC; interfaces DIPS, RMIS.
GICS	357.0	COBOL IRS	5 progs 20K lines 500 progs 2K lines		8134	WCC	25 HQ Reg.	O/B	Reg. Stts.	Regional minis will displace regional software on WCC; interfaces regional construction grants system, FRS, Industry Profiles, NEEDS Survey, O&M, CIS.
Other ORM	20.6				1774	WCC		O/B		
Other OPM	1.1				1	WCC		O		
Total OPM	1400.0 1307.7				42079 95520	WCC NCC				

CURRENT CONVERSION WORKLOAD STATISTICS

ORGANIZATION ADP ACTIVITY	FY '77 BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			PLANS AND INTERFACES
		TYPE	PROGS. LINES	TAPE REELS	DISK TRACKS		NO. . LOC.	USE MODE	USER SW	
OFFICE OF ENFORCEMENT Office of General Enforcement										
CDS	59.0	COBOL		-	635	WCC	HQ Reg. Stts	O/B		Interfaces FRS, CDHS, STATES systems.
PEMS	65.0	COBOL		-	3922	WCC	HQ Reg.	O/B		Interfaces ERSS.
Data Base Access	.5 53.0	IRS COBOL			2 1421	NCC WCC	Reg. Sts.	O/B		Interfaces NEDS, SAROAD. Interfaces STORET, PEMS, CDS.
Other OGE	42.2 3.6				911 231	WCC NCC		O/B		
Office of Water Enforcement:										
PCS	88.0	COBOL	20 progs 10K lines		3572	WCC	200 HQ Reg Stts	O/B	50 - 100 progs Reg. Stts.	100% increase in software by 1981; regional minis interface planned; more states will use with own software.
Other OWE	67.6				6069 —	WCC NCC		O/B O		

CURRENT CONVERSION WORKLOAD STATISTICS

ORGANIZATION ADP ACTIVITY	FY '77 BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			PLANS AND INTERFACES
		TYPE	PROGS. LINES	TAPE REELS	DISK TRACKS		NO. LOC.	USE MODE	USER SW	
Mobile Source and Noise Enforcement										
Emission System	62.5	COBOL S2K FORTRAN			2379	WCC	HQ	O/B	—	Considering use of PL/1.
Other MSNE	39.3 48.0				2119 2178	WCC NCC		O/B		
Other OE	.6				11	WCC		O/B		
Total OE	477.2 8.9				21039 2411	WCC NCC				

CURRENT CONVERSION WORKLOAD STATISTICS

ORGANIZATION ADP ACTIVITY	FY '77 BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			PLANS AND INTERFACES
		TYPE	PROGS. LINES	TAPE REELS	DISK TRACKS		NO. . LOC.	USE MODE	USER SW	
STAFF OFFICES										
NEPA Compliance MIS	42.0	COBOL IRS EASYTRIEVE SHIM		-	1787	WCC	5 HQ	O/B	—	
Public Affairs Mail List	5.2	IRS FORTRAN COBOL		8	317	WCC	HQ	O/B	-	DIPS Interface.
Other Staff	1.0			-	3	WCC		O/B		
Total Staff	48.2			8	2107	WCC				

CURRENT CONVERSION WORKLOAD STATISTICS

ORGANIZATION ADP ACTIVITY	FY '77 BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			PLANS AND INTERFACES
		TYPE	PROGS. LINES	TAPE REELS	DISK TRACKS		NO. LOC.	USE MODE	USER SW	
OFFICE OF WATER AND HAZARDOUS MATERIALS Office of Solid Waste										
SWIRS	85.4	STIMS		-	1983	WCC	HQ	O/B	-	
Other OSW	26.6 .6				1059 35	WCC NCC		O/B		
Office of Water Planning and Standards:										
STORET - Anal. & Mgmt.	114.0	PL/1	100 progs 360K lines	50	5000	WCC	HQ	O/B		Insight/Adroit Graphics software ready in 1979.
		FORTRAN COBOL ASSEM. GRAPHICS	40K lines							
STORET - Div. Use	586.0			800	55000	WCC	1300 HQ Reg. Stts Labs	O/B	100-150 prog	PCS, EDS, Regional/States interfaces; BIOSTORET, Toxics will use; 20% software growth by 1981.
Industry Profiles	145.0	S2K COBOL		50	2893	WCC	HQ	O/B	-	GICS, PCS, STORET interfaces.

CURRENT CONVERSION WORKLOAD STATISTICS

ORGANIZATION ADP ACTIVITY	FY '77 BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			PLANS AND INTERFACES
		TYPE	PROGS. LINES	TAPE REELS	DISK TRACKS		NO. . LOC.	USE MODE	USER SW	
Other OWPS	75.7				5615	WCC		O/B		
Office of Water Programs and Operations:										
O & M Reports	51.0	MARK IV		10	1365	WCC	HQ CINC.	O/B	-	
Regional Construction Grants MIS	160.0	COBOL IRS FORTRAN EASYTRIEVE		110	8000	WCC	HQ	O/B	-	STORET, NEEDS, O&M, GICS Interfaces.
SPCC	41.0	COBOL S2K		10	2523	WCC	HQ Reg	O/B		
NEEDS Survey	247.0	PL/1 COBOL		60	6955	WCC	HQ	O/B	-	PCS, GICS, O&M interfaces.
Other OWPO	41.7 10.0				836 658	WCC NCC		O/B O		
Office of Water Supply:										
MSIS	-	COBOL	200K ln			WCC	HQ Reg Stts	O/B		In development for FY 78 operation; versions for Univac, Honeywell, CDC, Burroughs for state use.

CURRENT CONVERSION WORKLOAD STATISTICS

ORGANIZATION ADP ACTIVITY	FY '77 BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			PLANS AND INTERFACES
		TYPE	PROGS. LINES	TAPE REELS	DISK TRACKS		NO. . LOC.	USE MODE	USER SW	
FRS	-	COBOL				WCC	HQ	O/B	-	In development for FY 78 operation.
Underground Injection Control	-	COBOL				WCC	HQ Reg. Stts	O/B		In development for FY 78 operation; Univac, Honeywell, CDC, Burroughs versions planned for state use.
OWS - MIS	-	COBOL				WCC	HQ	O/B	-	In development for FY 78 operation.
Existing Water Supply	116.9	COBOL PL/1 IRS		50	2700	WCC		O/B		
Other OWHM	-									
Total OWHM	1539.5 10.6				89845 693	WCC NCC				

CURRENT CONVERSION WORKLOAD STATISTICS

ORGANIZATION ADP ACTIVITY	FY '77 BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			PLANS AND INTERFACES
		TYPE	PROGS. LINES	TAPE REELS	DISK TRACKS		NO. LOC.	USE MODE	USER SW	
OFFICE OF AIR AND WASTE MANAGEMENT Office of Air Quality Planning and Standards										
SAROAD	648.0	COBOL S2K	140 progs 15 progs	500	39664	NCC	65 NADB Reg.	O/B	-	NEDS, RAPS, AEROS interfaces; software stable to 1981.
NEDS	327.2	COBOL	87 progs	300	18776	NCC	65 NADB Reg.	O/B	-	SAROAD, RAPS, AEROS interfaces. Software stable to 1981.
Trends Reports	95.4	COBOL FORTRAN SCORE IV		12	11000	NCC	NADB Reg.	O/B	-	NEDS, SAROAD, regional systems interfaces.
FDS	153.6	S2K COBOL FORTRAN	9 progs 4 progs	245	11000	NCC	NADB Reg.	O/B	-	NEDS,. SAROAD, CDS interface. 80% COBOL by volume of lines. Software stable to 1981.
Other OAQPS	33.4 367.4				343 16560	WCC NCC		O/B		
Office of Mobile Source and Air Pollution Control:										
Other OMSAPC	6.0				33	WCC		O/B		
Office of Noise Abatement and Control:										
Noise Analytical Services	113.7	FORTRAN COBOL		-	2880	WCC	HQ	O/B	-	
Other ONAC	.4				57	WCC				

CURRENT CONVERSION WORKLOAD STATISTICS

ORGANIZATION ADP ACTIVITY	FY '77 BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			PLANS AND INTERFACES
		TYPE	PROGS. LINES	TAPE REELS	DISK TRACKS		NO. . LOC.	USE MODE	USER SW	
Office of Radiation Programs										
Radiation Anal. Servs.	51.6	MARK IV FORTRAN IRS SAS		24	1706	WCC	HQ	O/B	-	
Other ORP	2.3				88	WCC		O/B		
Other OAWM	11.1				21 5	WCC WCC		O/B		
Total OAWM	218.5 1591.7				5128 97005	WCC NCC				

CURRENT CONVERSION WORKLOAD STATISTICS

ORGANIZATION ADP ACTIVITY	FY '77 BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			PLANS AND INTERFACES
		TYPE	PROGS. LINES	TAPE REELS	DISK TRACKS		NO. LOC.	USE MODE	USER SW	
OFFICE OF RESEARCH AND DEVELOPMENT (ORD) (OANMU)										
ESRL (RTP) RAPS	540.0				38000	NCC		O/B		1980 life cycle end. State system will replace
AQSM	29.0	FORTRAN			3000	NCC		O/B		
Particle Characteristics	34.5	FORTRAN GRAPHICS		27	1000	NCC	ESRL	O/B	-	
Aerosol Sampling & Analys.	13.4	FORTRAN		10	1000	NCC	ESRL	O/B	-	1985 life cycle end.
State						NCC				To replace RAPS (under development) before 1980
Other ESRL(RTP)	26.3				2000	NCC		O/B		
MERL (CINC.): Water Supply Sim.	16.3	FORTRAN			500	NCC	MERL	O/B	-	Future interface with STORET.
Wastewater Treatmt. D.B.		FORTRAN				WCC		O/B		In development, operational by 1981.
Other MERL (CINC.)	27.1 17.9				976 1720	WCC NCC		O/B		
ERL (ATHENS) Basin Planning Model	21.0	FORTRAN			1200	WCC	ERL	O/B	-	Will convert to PDP 11/70 in 1977.

CURRENT CONVERSION WORKLOAD STATISTICS

ORGANIZATION ADP ACTIVITY	FY '77 BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			PLANS AND INTERFACES
		TYPE	PROGS. LINES	TAPE REELS	DISK TRACKS		NO. . LOC.	USE MODE	USER SW	
Evaluation Modl	.8	FORTRAN			1800	WCC	ERL	O/B	-	Will convert to PDP 11/70 in 1977.
Other ERL	53.3				1600	WCC		O/.B		
ADA Other ADA	7.6				1	WCC		O/B		
Other OALWU	3.2				73	WCC		O/B		
OEMI IERL (RTP) EADS	-	COOBOL PL/1 FORTRAN S2K				NCC	IERL	O/B	-	In development, operational in FY 78. Interfaces FPEIS.
FPEIS	40.5	S2K COBOL PL/1 FORTRAN		20	1000	NCC	IERL Reg.	O/B	-	In development, operational in FY 78. Interfaces EADS, NEDS, SAROAD.
General ADP	59.5	COBOL PL/1 FORTRAN		75	6000	NCC	IERL	O/B	-	Interfaces NEDS, SAROAD, STORET.
MIS	93.0	S2K COBOL				NCC	IW Reg. Labs	O/B		

CURRENT CONVERSION WORKLOAD STATISTICS

ORGANIZATION ADP ACTIVITY	FY '77 BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			PLANS AND INTERFACES
		TYPE	PROGS. LINES	TAPE REELS	DISK TRACKS		NO. . LOC.	USE MODE	USER SW	
Other IERL (RTP)	1.6				733	NCC		O/B		
IERL (CINC.) Admin.	7.0	IRS			158	WCC	IERL	O/B	-	
Other IERL (CINC.)	3.5				251	WCC		O/B		
OEMI (HQ) Technology Assessment	140.0	FORTRAN COBOL	30 prog 40K lns	20	2500	WCC	8 HQ	O/B	-	60% software growth by 1981.
Other OEMI	42.5				1217	WCC		O/B		
OHEE: HERL (RTP)										
Spec. Studies	46.5	COBOL, S2K FORTRAN STATISTICAL SOFTWARE		14	10000	NCC	HERL	O/B	-	Interfaces SAROAD.
New Epidem. Studies 3	3.00	COBOL FORTRAN STAT.*	-	- 300	30K	NCC	HERL	O/B	-	New Applications will experience a high rate of growth by 1980.
Mortality Studies	8.2	FORTRAN COBOL STAT.*		250	1100	NCC	HERL	O/B	-	

*SAD, SPSS, BIOSTAT, other Stat. Sftwr.

CURRENT CONVERSION WORKLOAD STATISTICS

ORGANIZATION ADP ACTIVITY	FY '77 BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			PLANS AND INTERFACES
		TYPE	PROGS. LINES	TAPE REELS	DISK TRACKS		NO. . LOC.	USE MODE	USER SW	
CHESS	135.0	COBOL FORTRAN SPSS SAS		630	80000	NCC	HERL	O/B	-	1980 life cycle end. Files will require conversion for use with other systems.
Physiol Studies	32.4	S2K COBOL FORTRAN STAT.*		50	9000	NCC	HERL	O/B	-	Lab PDP 11/40 interface. Usage will increase by 1980.
Exp. Biology Support	20.0	COBOL FORTRAN SPSS STAT. *		20	3000	NCC	HERL	O/B	-	Utilizes many statistical packages (MLAB, BMD, SAS, PAX II, KWIC). Lab computer automation interface.
Aerometric Systems	20.0	FORTRAN COBOL STAT. *		29	1000	NCC	HERL	O/B	-	Interfaces CHESS, SAROAD, Special Studies. PDP 11 Interface.
Statistical Support	40.0	SAS SPSS MLAB BMD COBOL FORTRAN SAAM BIOSTAT OTHER STAT. SFTWR		250	1100	NCC	HERL	O/B	-	

*SAS, SPSS, BIOSTAT, other Stat. Sftwr.

CURRENT CONVERSION WORKLOAD STATISTICS

ORGANIZATION ADP ACTIVITY	FY '77 BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			PLANS AND INTERFACES
		TYPE	PROGS. LINES	TAPE REELS	DISK TRACKS		NO. . LOC.	USE MODE	USER SW	
Pesticides Toxicology	4.7	FORTRAN COBOL STAT.*		2	200	NCC	HERL	O	-	
MIS	125.0	S2K COBOL		25	3000	NCC	HERL	O/B	-	
Other HERL (RTP)	.9 110.5				1325	WCC NCC		O/B		
HERL (CINC.) Other HERL (CINC.)	57.1 .1				541 1	WCC NCC		O/B		
CORVALLIS Lake Survey	9.1	FORTRAN		2	517	WCC OSU	Reg. Stts	O/B	via STOR-ET	Interfaces SHAVES, STORET.
Other Corvallis	21.8 .2				343 256	WCC NCC		O/B		
GROSSE ILE Water Quality Models	101.8	FORTRAN PL/1 ASSEM. GRAPHICS			2701	WCC	Labs. Reg.	O/B	via STOR-ET	Interfaces STORET, LAB PDP 11/45, BIOSTORET (planned).

CURRENT CONVERSION WORKLOAD STATISTICS

ORGANIZATION ADP ACTIVITY	FY '77 BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			PLANS AND INTERFACES
		TYPE	PROGS. LINES	TAPE REELS	DISK TRACKS		NO. LOC.	USE MODE	USER SW	
Other GROSS ILE	24.3 17.5				37 2932	WCC NCC		O/B		
Other NARRAGANSETT	15.0 .1				931 12	WCC NCC		O/B		
Other GULF BREEZE	22.8 1.4				980 955	WCC NCC		O/B		
Other OHEE	.6				521	NCC				
OMTS EMSL (Las Vegas)										
Air Quality Monitoring	2.4	FORTRAN		1000	-	NCC ERDA	Reg.	B	-	
STORET	126.36				2629	WCC	EMSL	O/B	-	
Other EMSL (Las Vegas)	52.0 .3				500 16	WCC NCC				
EMSL (CINC.) Quality Assurance	13.2	FORTRAN		2	1000	NCC		O/B	-	In development.

CURRENT CONVERSION WORKLOAD STATISTICS

ORGANIZATION ADP ACTIVITY	FY '77 BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			PLANS AND INTERFACES
		TYPE	PROGS. LINES	TAPE REELS	DISK TRACKS		NO. LOC.	USE MODE	USER SW	
BIOSTORET	-	COBOL FORTRAN S2K				WCC	Reg. Stts.	O/B	-	In development, pilot operation in 1977.
Other EMSL (CINC.)	47.5 1.3				3390 87	WCC NCC		O/B		
EMSL (RTP) HCPSS	86.04	COBOL(60%) FORTRAN -- S2K (19%)	(20%)	100	-	NCC	HQ Reg.	O/B	-	AEROS, Lab PDP 11 interfaces.
Other EMSL (RTP)	66.36				13381	NCC		O/B		
Other OHTS	15.3 .7				429 5	WCC NCC		O/B		
ORD (HQ) MIS	95.0	IRS COBOL		-	5201	WCC	HQ Labs.	O/B	-	
Total ORD	863.5 1602.6				28413 142339	WCC NCC				

CURRENT CONVERSION WORKLOAD STATISTICS

ORGANIZATION ADP ACTIVITY	FY '77 BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			PLANS AND INTERFACES
		TYPE	PROGS. LINES	TAPE REELS	DISK TRACKS		NO. LOC.	USE MODE	USER SW	
OFFICE OF TOXIC SUBSTANCES										
Math Modeling	51.6	IRS COBOL FORTRAN		12	1304	WCC	HQ	O/B		Interfaces SAROAD, STORET.
Office of Pesticides Programs										
Company Data Systems	272.0	COBOL		3	9	WCC	HQ	O/B	-	PDP 11/70 requested for all OPP systems. PPIS interface.
Ecological Monitoring	29.0	COBOL			1	WCC	HQ	O/B	-	
PPIS	568.0	COBOL	265 pgs 262k ln	800	34000	WCC	12 HQ	O/B	-	Will use DBMS with PDP 11/70; software stable to 1981.
Other OPP	53.9				80	WCC		O/B		
Other OTS	.6				3	NCC		O		
Total OTS	974.5 .6				35394 3	WCC NCC				

CURRENT CONVERSION WORKLOAD STATISTICS

ORGANIZATION ADP ACTIVITY	FY '77 BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			PLANS AND INTERFACES
		TYPE	PROGS. LINES	TAPE REELS	DISK TRACKS		NO. LOC.	USE MODE	USER SW	
REGIONAL OFFICES										
(REGION I) Nat'l. Systems (SAROAD, NEDS, PEMS, ERSS, PCS, STORET, CDS, GICS, PPS, FRS, SPCC)	92.9			17 17	5260 218	WCC NCC		O/B O/B		
AQDS	14.5	PL/1 COBOL FORTRAN		33	841	WCC		O/B		Will discontinue in FY 79 or when SAROAD stabilized.
Other Region I	29.9				297 635	WCC NCC		O/B		
(REGION II) Nat'l. Systems (Incomplete for NCC)	46.4			25	794	WCC		O/B		
WERS	65.6	FORTRAN COBOL IRS		4	746	WCC	Reg. II NJ	O/B	-	Interfaces STORET, GICS.
Other Region II	60.7 14.7				1491 209	WCC NCC		O/B		

CURRENT CONVERSION WORKLOAD STATISTICS

ORGANIZATION ADP ACTIVITY	FY '77 BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			PLANS AND INTERFACES
		TYPE	PROGS. LINES	TAPE REELS	DISK TRACKS		NO. . LOC.	USE MODE	USER SW	
(REGION III) Nat'l. Systems (Incomplete)	3.7				225	WCC		O/B		
Other Region III	270.3 15.2				2557 168	WCC NCC		O/B		
(REGION IV) Nat'l. Systems	58.8				90 2000	WCC NC		O/B		
Other Region IV	380.9 8.0				12621 -	WCC NCC		O/B		
(REGION V) Nat'l. Systems	198.4				3294 12700	WCC NCC		O/B		
Other Region V	196.9 34.3				5108 1900	WCC NCC		O/B		
(REGION VI) Nat'l. Systems (Incomplete for NCC)	145.2				479	WCC		O/B		
RRS	17.7	PL/1			15	WCC	Reg. VI	O/B	-	Interfaces PCS.

CURRENT CONVERSION WORKLOAD STATISTICS

ORGANIZATION ADP ACTIVITY	FY '77 BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			PLANS AND INTERFACES
		TYPE	PROGS. LINES	TAPE REELS	DISK TRACKS		NO. . LOC.	USE MODE	USER SW	
Other Region VI	61.8 7.9				1587 110	WCC NCC		O/B		
(REGION VII) Nat'l. Systems	38.6				1317 100	WCC NCC		O/B		
LAMS	15.6	COBOL			114	NCC	Reg. VII	O/B	-	Interfaces STORET.
Other Region VII	81.5 6.5				42 338	WCC NCC		O/B		
(REGION VIII) Nat'l. Systems	40.76				163 210	WCC NCC		O/B		
Management	36.0	PL/1 COBOL			55	WCC		O/B	-	
Other Region VIII	64.3 1.3				843 64	WCC NCC		O/B		
(REGION IX) Nat'l. Systems	60.9				760 300	WCC NCC		O/B		

CURRENT CONVERSION WORKLOAD STATISTICS

ORGANIZATION ADP ACTIVITY	FY '77 BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			PLANS AND INTERFACES
		TYPE	PROGS. LINES	TAPE REELS	DISK TRACKS		NO. . LOC.	USE MODE	USER SW	
Other Region IX	106.2 3.8				1835 328	WCC NCC		O/B		
(REGION X) Nat'l. Systems	49.3				166 10	WCC NCC		O/B		
Water Quality Modeling	29.4	FORTRAN PL/1 BASIC			91	WCC	Reg. X	O/B		
Regional Management	36.24	IHS COBOL			2589	WCC	Reg.	O/B	-	Regional PDP 11/70 planned.
Other Region X	21.5 .1				153 153	WCC NCC		O/B O/B		

APPENDIX B

PROJECTED CONVERSION WORKLOAD FOR 1981

PROJECTED CONVERSION WORKLOAD FOR 1981

ORGANIZATION ADP ACTIVITY	ANNUAL BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			COMPATIBLE MAJOR IMPACT AREAS	NON-COMPATIBLE SYSTEM MAJOR IMPACT AREAS
		TYPE	PROG LINES	TAPE REELS	DISK TRACKS		NO. LOC	USE MODE	USER SW		
OFFICE OF PLANNING AND MANAGEMENT (OPM) Office of Administration (OA)											
Gen. Admin. Supt	59.8	IRS (60%) COBOL		4	2152	WCC	HQ	O/B	—	Software language mix.	Same as compatible plus IRS and PL/1 usage.
Gen. Res. Supt.	69.6 69.1	FORTRAN		5 5	7000 7000	NCC WCC	HQ Labs.	O/B	—	Spread over WCC and NCC, command lang. differences, lab usage.	Same as compatible.
Library System	28.3	IRS		—	1074	WCC	HQ	O/B	—	(No major areas).	IRS usage.
PPS (Pers. Prop. Sys.)	67.5	COBOL IRS		1.3	3717	WCC	HW Reg.. Labs.	O/B		Field usage and retraining.	Same as compatible plus use of IRS.
CIS (Contracts Inf. Sys.)	151.1	COBOL IRS		5	1255	NCC	HQW	O/B	—	(No major areas).	IRS usage.
TSSMS	53.9	IRS COBOL	30 prog. 4 prog.	12	1892	NCC	5 HQ	O/B	—	(No major areas).	IRS usage.
PMIS (DIPS)	160.3	PL/1 IRS COBOL		30	3373	NCC	HQ Reg. Labs.	O/B	—	Software mix, field usage and retraining	Same as compatible plus IRS and PL/1 usage.
OA OTHER	688.4 1877.8			— —	15616 135460	WCC NCC		O/B		Data base sizes and potential need to reorganize.	Same as compatible plus definite need to re-organize.

PROJECTED CONVERSION WORKLOAD FOR 1981

ORGANIZATION ADP ACTIVITY	ANNUAL BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			COMPATIBLE MAJOR IMPACT AREAS	NON-COMPATIBLE SYSTEM MAJOR IMPACT AREAS
		TYPE	PROG LINES	TAPE REELS	DISK TRACKS		NO. LOC	USE MODE	USER SW		
Office of Planning and Evaluation											
OPE Other	78.9 27.1			— —	3295 575	WCC NCC		O/B			
Office of Resource Management (ORM)											
RMIS (Resource MIS)	138.4	IRS COBOL		-	4212	WCC	HQ	O/B	-	(No major areas).	IRS usage.
FMS (Formal Mgmt. System)	435.4	COBOL IRS ASSEM.		764	22915	WCC	HQ Regs. Labs.	B		Data base conversion, field usage and retraining.	Same as compatible plus IRS and ASSEMBLER usage.
FRS (Formal Rep. System)	44.3	IRS (60%) FORTRAN PL/1 COBOL		25	3444	WCC	HQ Reg.	O/B		Software mix, field field usage and retraining, regional mini's interface.	Same as compatible plus IRS and PL/1 usage.
GICS (Grants Inf. Sys.)	545.4	COBOL	505 pgs 22K lns 5 update 500 output (small)	--	13240	WCC	25 HQ Reg. Sts.	O/B	Sts.	Regional mini's interface, data base conversion, field usage & retraining, States' software.	Same as compatible.
ORM Other	30.0			—	2586	WCC		O/B		Command language.	Same as compatible.
OPM Other	1.6			1	—	WCC					
TOTAL OPM	2115.9 1974.0				62596 143035	WCC NCC					

PROJECTED CONVERSION WORKLOAD FOR 1981

ORGANIZATION ADP ACTIVITY	ANNUAL BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			COMPATIBLE MAJOR IMPACT AREAS	NON-COMPATIBLE SYSTEM MAJOR IMPACT AREAS
		TYPE	PROG LINES	TAPE REELS	DISK TRACKS		NO. LOC	USE MODE	USER SW		
OFFICE OF ENFORCEMENT Stationary Source Enforcement											
CDS (Compliance Data Sys.)	198.5	COBOL		—	1917	WCC	HQ Reg. Sts.	O/B		Field usage and retraining.	Same as compatible.
PFMS (Pesticides Enf. Mon.)	105.2	COBOL		—	7342	WCC	HQ Reg.	O/B		Field usage and retraining.	Same as compatible.
Data Base Access (Denver)	1.4 129.9	IRS COBOL		— 174	7 4934	NCC WCC	Reg. Sts.	O/B		WCC and NCC operation spread, field	Same as compatible plus IRS usage.
Other SSE	106.5 9.2				2325 589	WCC NCC		O/B			
Water Enforcement											
PCS (Permit Compliance)	233.4	COBOL	40 prog 20K lns	- -	13469	WCC	225 HQ Reg. Sts.	O/B	100 Reg Sts.	Regional/State Software, regional mini's interface, field usage and retraining, data base conversion.	Same as compatible plus data base reorganization
Other WE	125.5				11261	WCC		O/B			

PROJECTED CONVERSION WORKLOAD FOR 1981

ORGANIZATION ADP ACTIVITY	ANNUAL BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			COMPATIBLE MAJOR IMPACT AREAS	NON-COMPATIBLE SYSTEM MAJOR IMPACT AREAS
		TYPE	PROG LINES	TAPE REELS	DISK TRACKS		NO. LOC	USE MODE	USER SW		
Mobile Source Enforcement											
Emissions System	136.4	COBOL S2K FORTRAN		76	5186	WCC	HQ	O/B	- -	(No major areas).	S2K usage.
Other MSE	63.7 7.8				3433 3528	WCC NCC		O/B			
Other OE	1.2				23	WCC		O/B			
Total OE	1100.3 18.4			250	49790 4117	WCC NCC					

PROJECTED CONVERSION WORKLOAD FOR 1981

ORGANIZATION ADP ACTIVITY	ANNUAL BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			COMPATIBLE MAJOR IMPACT AREAS	NON-COMPATIBLE SYSTEM MAJOR IMPACT AREAS
		TYPE	PROG LINES	TAPE REELS	DISK TRACKS		NO. LOC	USE MODE	USER SW		
STAFF OFFICES											
NEPA Compliance MIS)	53.3	COBOL IRS EASYTRIEVE SHIM		- -	2265	WCC	5 HQ	O/B	- -	Software mix, command language.	Same as compatible plus use of IRS, EASYTRIEVE, SHIM packages.
Public Affairs Mail List	8.4	IRS FORTRAN COBOL		13	516	WCC	HQ	O/B	- -	Software mix.	Same, plus IRS usage.
Other STAFF	1.4			- -	5	WCC		O/B			
Total STAFF	63.1				2785	WCC					

PROJECTED CONVERSION WORKLOAD FOR 1981

ORGANIZATION ADP ACTIVITY	ANNUAL BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			COMPATIBLE MAJOR IMPACT AREAS	NON-COMPATIBLE SYSTEM MAJOR IMPACT AREAS
		TYPE	PROG LINES	TAPE REELS	DISK TRACKS		NO. LOC	USE MODE	USER SW		
OFFICE OF WATER AND HAZARDOUS MATERIALS											
Office of Solid Waste											
SWIRS	599.0	STIMS RECON COBOL		-	13900	WCC	HQ	O/B	-	Software transfer, softwre mix, data base conversion.	Same plus use of STIMS/RECON.
Other OSW	186.8			-	7485	WCC		O/B			
Office of Water Planning and Standards											
STORET - Anal. & Mgmt.	208.0	PL/1 FORTRAN) COBOL) ASSEM.) GRAPHICS)	120 pgs 430K ls 50K lns	81	8000	WCC	HQ	O/B		Regional and lab mini interfaces, regional/state software, software mix, data base conversion graphics software, compiler extensions, field usage and retraining large number of users.	Same as compatible plus data base reorganization use of PL/1 and Assembler, imbedded system macros and subroutines. Major redesign effort.
STORET - Div. Use	1010.8			1340	72000	WCC	1300 HQ Reg. Sts. Labs	O/B	150 Prog Reg. Sts.		
Industry Profile	250.1	S2K COBOL		76	4412	WCC	HQ	O/B	- -	STORET interface, graphics software.	Same as compatible plus S2K usage.

PROJECTED CONVERSION WORKLOAD FOR 1981

ORGANIZATION ADP ACTIVITY	ANNUAL BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			COMPATIBLE MAJOR IMPACT AREAS	NON-COMPATIBLE SYSTEM MAJOR IMPACT AREAS
		TYPE	PROG LINES	TAPE REELS	DISK TRACKS		NO. LOC	USE MODE	USER SW		
Other OWPS	123.7 .1	S2K		76	9180 19	WCC NCC	HQ	O/B	- -		
Office of Water Programs Operations											
Oper. & Maint. Reports	80.4	MARK IV GRAPHICS		15	2082	WCC	HQ Cinc.	O/B	- -	Software mix, field usage.	Same as compatible plus MARK IV and GRAPHICS usage.
Regional Construction Grants MIS	228.1	COBOL IRS FORTRAN EASYTRIEVE		157	11404	WCC	HQ	O/B	- -	Software mix.	Same, plus use of IRS, EASYTRIEVE, and data base reorganization.
SPCC	83.4	COBOL S2K		22	6688	WCC	HQ Reg.	O/B		Field usage and	Same plus S2K usage.
Needs Survey	659.1	PL/1 COBOL		146	16867	WCC	HQ	O/B	- -	Data base conversion	Same plus use of PL/1.
Other OWPO	68.1 16.4				1368 1076	WCC NCC		O/B		Command language.	Same as compatible.

PROJECTED CONVERSION WORKLOAD FOR 1981

ORGANIZATION ADP ACTIVITY	ANNUAL BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			COMPATIBLE MAJOR IMPACT AREAS	NON-COMPATIBLE SYSTEM MAJOR IMPACT AREAS
		TYPE	PROG LINES	TAPE REELS	DISK TRACKS		NO. LOC	USE MODE	USER SW		
Office of Water Supply											
MSIS	142.4	COBOL	200K ls	201	8541	WCC	HQ Reg. Sts.	O/B		Field usage and retraining.	Same as compatible (software may be machine independent.)
FRS	218.3	COBOL		40	5584	WCC	HQ	O/B	- -	(No major areas)	(No major areas) nless S2K used.
Underground Inject. Cntrl.	113.9	COBOL		161	6833	WCC	HQ Regs Sts.	O/B		Field usage and retraining.	Same as compatible. (software may be machine independent.)
OWS-MIS	170.8	COBOL		68	6833	WCC	HQ	O/B		(No major areas)	(No major areas) unless S2K used.
Total OWHM	4142.9 16.4				241186 1095	WCC NCC					

PROJECTED CONVERSION WORKLOAD FOR 1981

ORGANIZATION ADP ACTIVITY	ANNUAL BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			COMPATIBLE MAJOR IMPACT AREAS	NON-COMPATIBLE SYSTEM MAJOR IMPACT AREAS
		TYPE	PROG LINES	TAPE REELS	DISK TRACKS		NO. LOC	USE MODE	USER SW		
OFFICE OF AIR AND WASTE MANAGEMENT Office of Air Quality Planning and Standards											
SAROAD	978.5	COBOL S2K	140 progs 15 progs	754	59900	NCC	65 NADB Regs	O/B	- -	Data base conversion field usage and retraining.	Same as compatible plus data base reorganization job stream change, compiler differences, imbedded logic, S2K.
NEDS	559.5	COBOL	87 prgs	512	32100	NCC	65 NADB Regs.	O/B	- -	Data base conversion field usage and retraining.	Same as SAROAD.
Trend Reports	149.0	COBOL FORTRAN SCORE IV		19	17300	NCC	NADB Reg.	O/B	- -	Software mix, data base conversion, field training, command language.	Same as compatible plus SCORE IV usage.
Energy Data System	346.0	COBOL S2K FORTRAN	4 progs 0 progs	552	24800	NCC	NADB Reg.	O/B	- -	Data base conversion field usage and retraining.	Same plus S2K usage.
Other OAQPS	54.2 595.1				555 26800	WCC NCC					

PROJECTED CONVERSION WORKLOAD FOR 1981

ORGANIZATION ADP ACTIVITY	ANNUAL BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			COMPATIBLE MAJOR IMPACT AREAS	NON-COMPATIBLE SYSTEM MAJOR IMPACT AREAS
		TYPE	PROG LINES	TAPE REELS	DISK TRACKS		NO. LOC	USE MODE	USER SW		
Office of Mobile Source and Air Pollution Control											
Other OMSAPC	11.0				61	WCC		O/B			
Office of Noise Abatement and Control											
Noise Analytical Service	184.0	FORTRAN COBOL		- -	4668	WCC	HQ	O/B		(No major areas)	(No major areas)
Other ONAC	.8				90	WCC					
Office of Radiation Programs											
Radiation Anal. Svcs.	-			-	-	WCC					
Other OAWM	23.1 .3			-	43 11	WCC NCC					
Total OAWM	273.1 2268.2				5417 203803	WCC NCC		O/B			

PROJECTED CONVERSION WORKLOAD FOR 1981

ORGANIZATION ADP ACTIVITY	ANNUAL BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			COMPATIBLE MAJOR IMPACT AREAS	NON-COMPATIBLE SYSTEM MAJOR IMPACT AREAS
		TYPE	PROG LINES	TAPE REELS	DISK TRACKS		NO. LOC	USE MODE	USER SW		
OFFICE OF RESEARCH AND DEVELOPMENT											
ONLMU - ESRL/RTP											
AWSM	72.6	FORTRAN		-	7500	NCC		O/B		Command language.	Same as compatible.
Particle Char.	70.8	FORTRAN GRAPHICS		58	2150	NCC	ESRL	O/B		Command language, graphics software.	Same as compatible.
Aerosol Sampl & Anal.	28.9	FORTRAN		21	2150	NCC	ESRL	O/B		(No major areas).	(No major areas).
State	612.5				43225	NCC		O/B		Command language, data base conversion	Same as compatible.
Other ESRL/RTP	66.5				5019	NCC		O/B		Command language.	Same as compatible.
MERL/CINC.											
Water Supply Sim.	32.8	FORTRAN			1005	NCC	MERL	O/B	-	Command language. STORET interface.	Same as compatible.
Waste Water Treat. D.B.	115.2	FORTRAN		40	2310	WCC		O/B		(No major areas)	(No major areas)
Other MERL	56.2 37.6				2026 3583	WCC NCC		O/B			

PROJECTED CONVERSION WORKLOAD FOR 1981

ORGANIZATION ADP ACTIVITY	ANNUAL BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			COMPATIBLE MAJOR IMPACT AREAS	NON-COMPATIBLE SYSTEM MAJOR IMPACT AREAS
		TYPE	PROG LINES	TAPE REELS	DISK TRACKS		NO. LOC	USE MODE	USER SW		
ERL/ATHENS											
Basin Plan. Modl	31.7	FORTRAN		-	1836	WCC	ERL	O/B	-	(No major areas).	(No major areas).
Evaluation Model	1.2	FORTRAN		-	2754	WCC	ERL	O/B	-	(No major areas).	(No major areas).
Other ERL	111.2				3304	WCC		O/B			
ADA											
Other ADA	15.8				3	WCC		O/B			
Other OAWM	6.6				151	WCC		O/B			
OEMI IERL/RTP											
EADS (Env. Asses. Data)	197.5	COBOL PL/1 FORTRAN S2K		-	4885	NCC	IERL	O/B	-	Software mix.	Same as compatible plus PL/1 and S2K usage.
FPEIS (Fine Part. Em.)	133.5	S2K COBOL PL/1 FORTRAN		66	3296	NCC	IERL Reg.	O/B	-	Software mix, SAROAD interface,	Same plus PL/1 and S2K usage, SAROAD/NEDS interface.

PROJECTED CONVERSION WORKLOAD FOR 1981

ORGANIZATION ADP ACTIVITY	ANNUAL BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			COMPATIBLE MAJOR IMPACT AREAS	NON-COMPATIBLE SYSTEM MAJOR IMPACT AREAS
		TYPE	PROG LINES	TAPE REELS	DISK TRACKS		NO. LOC	USE MODE	USER SW		
General ADP	103.9	COBOL PL/1 FORTRAN		131	10476	NCC	IERL	O/B	-	Software mix; SAROAD, STORET interfaces.	Same plus PL/1 usage.
MIS	306.6	S2K COBOL				NCC	HQ Reg Labs	O/B	-	Field usage and re-training, command language.	Same plus S2K usage.
Other IERL/RTP	3.6				1683	NCC		O/B			
IERL/CINC.:											
Admin.	21.2	IRS			478	WCC	IERL	O/B	-	(No major areas).	(No major areas).
Other IERL/CINC	8.9				561	WCC		O/B			
OEMI/HQ:											
Tech. Assess.	420.4	FORTRAN COBOL	45 prog 60K lns	54	6758	WCC	8 HQ	O/B	-	(No major areas).	(No major areas).
Other OEMI	130.2				3729	WCC		O/B			

PROJECTED CONVERSION WORKLOAD FOR 1981

ORGANIZATION ADP ACTIVITY	ANNUAL BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			COMPATIBLE MAJOR IMPACT AREAS	NON-COMPATIBLE SYSTEM MAJOR IMPACT AREAS
		TYPE	PROG LINES	TAPE REELS	DISK TRACKS		NO. LOC	USE MODE	USER SW		
CHEE HERL/RTP											
Special Studies	110.0	COBOL S2K FORTRAN STAT.*		37	19200	NCC	HERL	O/B	-	Software mix, data base conversion, command language, statistical software.	Same plus use of S2K.
Epidem. Studies	250.0	COBOL FORTRAN STAT.*		393	31200	NCC	HERL	O/B	-	Data base conversion OCR Input, Statistical packages.	Same.
Mortality Studies	140.0	FORTRAN COBOL STAT.*		512	2056	NCC	HERL	O/B	-	Compiler versions and extensions, imbedded subroutines, stat. packages.	Same.
Physio. Studies	260.0	S2K COBOL STAT.*				NCC	HERL	O/B	-	Software mix, PDP 11/40 interface, command language, stat. packages.	Same plus use of S2K.
Exp. Biology Support	72.0	COBOL FORTRAN SPSS,etc.		45	6750	NCC	HERL	O/B	-	Software mix, statistical and special software.	Same as compatible, plus command language.
Aerometric Systems	125K	FORTRAN COBOL STAT.*		92	3150	NCC	HERL	O/B	-	CAI Interface SAROAD interface, software packages, PDP 11/40 interface.	Same as compatible.
CHESS		N/A		630	80000	NCC	HERL	O/B	-	Data base conversion.	Same as compatible.

*SAS, SPSS, BIOSTAT, MISC. STAT. SFTWR.

PROJECTED CONVERSION WORKLOAD FOR 1981

ORGANIZATION ADP ACTIVITY	ANNUAL BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			COMPATIBLE MAJOR IMPACT AREAS	NON-COMPATIBLE SYSTEM MAJOR IMPACT AREAS
		TYPE	PROG LINES	TAPE REELS	DISK TRACKS		NO. LOC	USE MODE	USER SW		
Statistical Support	75.0	SAS SPSS MLAB BMD COBOL FORTRAN		43	2000	NCC	HERL	O/B	-	Software mix, special software packages, command language.	Same as compatible.
MIS	150.0	S2K COBOL		40	4800	NCC	HERL	O/B	-	Command language.	Same plus S2K usage.
Pesticides Toxicology	100.0	FORTRAN COBOL STAT.*		13	1330	NCC	HERL	O/B	—	Software mix, special software, command language.	Same as compatible.
Other HERL/RTP	2.1 254.1				- 3047	WCC NCC					
Other HERL/CINC.	40.5 .2				1118 2	WCC NCC					
CORVALLIS:											
Lake Survey	5.3	FORTRAN		1	228	WCC	Reg Stts.	O/B via STORET		STORET interface, field usage and retraining.	Same as compatible.

*SAS, SPSS, BIOSTAT, MISC. STAT. SFTWR.

PROJECTED CONVERSION WORKLOAD FOR 1981

ORGANIZATION ADP ACTIVITY	ANNUAL BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			COMPATIBLE MAJOR IMPACT AREAS	NON-COMPATIBLE SYSTEM MAJOR IMPACT AREAS
		TYPE	PROG LINES	TAPE REELS	DISK TRACKS		NO. LOC	USE MODE	USER SW		
Other CORVALLIS	14.8 .2				230 173	WCC NCC		O/B			
GROSSE ILE:											
Water Qual. Models	1221.2	FORTRAN PL/1 ASSEM. GRAPHICS			32411	WCC	Labs Reg Stts.	O/B via STOR-ET		Software mix, data base conversion, graphics software, field usage/retraining.	Same plus use of PL/1 and Assembler.
Other GROSSE ILE	516.0 317.0				785 62155	WCC NCC		O/B O/B		Data base conversion	Same plus command language.
Other NARRAGANSETT	31.0				1923 24	WCC NCC		O/B			
Other GULF BREEZE	47.1 2.9				2024 1973	WCC NCC		O/B			
OMTS: EMSL/LAS VEGAS											
Air Qual. Mon.	5.0	FORTRAN		2090	-	NCC	Reg	B	-	Field usage, lab cassette input.	Same as compatible.
STORET	264.1			-	5495	WCC	EMSL	O/B		Same as STORET.	Same as STORET.

PROJECTED CONVERSION WORKLOAD FOR 1981

ORGANIZATION ADP ACTIVITY	ANNUAL BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			COMPATIBLE MAJOR IMPACT AREAS	NON-COMPATIBLE SYSTEM MAJOR IMPACT AREAS
		TYPE	PROG LINES	TAPE REELS	DISK TRACKS		NO. LOC	USE MODE	USER SW		
Other EMSL/ LAS VEGAS	145.9 .9				1620 44	WCC NCC		O/B			
EMSL/CINC.:											
Quality Assurance	22.0	FORTRAN		3	1620	NCC		O/B		Command language.	Same as compatible.
BIOSTORET	667.3	COBOL FORTRAN S2K		912	62719	WCC	Reg. Stts.	O/B		Data base conversion field usage and retraining.	Same plus S2K usage.
Other EMSL/CINC.	95.9 2.7				7055 182	WCC NCC		O/B			
EMSL/RTP NCPSS	246.9	COBOL(60%) FORTRAN - S2K (19%)	(20%)	322	-	NCC	HQ Reg.	O/B	-	Field usage, SAROAD interface, large data base potential.	Same plus use of S2K.
Other EMSL/RTP	260.7				52654	NCC		O/B		Large data base conversion.	Same plus command language.
Other OMTS	38.9 1.7				1090 13	WCC NCC		O/B			

PROJECTED CONVERSION WORKLOAD FOR 1981

ORGANIZATION ADP ACTIVITY	ANNUAL BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			COMPATIBLE MAJOR IMPACT AREAS	NON-COMPATIBLE SYSTEM MAJOR IMPACT AREAS
		TYPE	PROG LINES	TAPE REELS	DISK TRACKS		NO. LOC	USE MODE	USER SW		
ORD/HQ: MIS	213.8	IRS COBOL		-	11702	WCC	HQ Labs	O/B	-	Field usage and retraining.	Same plus IRS usage.
Other ORD	18.1 6.0				1584 459	WCC NCC		O/B			
Total ORD	4243.6 3611.2				153864 351045	WCC NCC					

PROJECTED CONVERSION WORKLOAD FOR 1981

ORGANIZATION ADP ACTIVITY	ANNUAL BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			COMPATIBLE MAJOR IMPACT AREAS	NON-COMPATIBLE SYSTEM MAJOR IMPACT AREAS
		TYPE	PROG LINES	TAPE REELS	DISK TRACKS		NO. LOC	USE MODE	USER SW		
OFFICE OF TOXIC SUBSTANCES											
Math Modeling	650.0	IRS COBOL FORTRAN		55	5792	WCC	HQ	O/B	-	SAROAD/STORET interfaces.	Same plus IRS usage.
Office of Pesticides Programs											
Company Data Sys	488.0	COBOL		6	18	WCC	HQ	O/D	- -	(No major areas).	No major areas unless DBMS is used.
Ecological Mon. Sys.	71.7	COBOL		- -	2	WCC	HQ	O/B	- -	(No major areas).	No major areas unless DBMS used.
PPIS (Pest. Prod Inf. Sys.)	915.4	COBOL	265 prg 262K ls	1289	54837	WCC	12 HQ	O/B	- -	Data base conversion size of data base.	Data base conversion and reorganization, potential DBMS use.
Other OPP	92.2				137	WCC		O/B			
Other OTS	1562.0 815.0			183 92	18915 9457	WCC NCC		O/B		Data base conversion	Same as compatible.
Total OTS	3779.3 815.0			238 92	79701 9457	WCC NCC					

PROJECTED CONVERSION WORKLOAD FOR 1981

ORGANIZATION ADP ACTIVITY	ANNUAL BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			COMPATIBLE MAJOR IMPACT AREAS	NON-COMPATIBLE SYSTEM MAJOR IMPACT AREAS
		TYPE	PROG LINES	TAPE REELS	DISK TRACKS		NO. LOC	USE MODE	USER SW		
REGIONAL OFFICES											
(REGION I) National Systems (SAROAD, NEDS, PFMS, ERSS, MSIS, PCS, STORET, CDS, GICS, PPS, FRS, SPCC)	175.6 41.9			35 30	8972 2200	WCC NCC		O/B		(See under each National System)	(See under each National System).
Other REGION I	76.0				755	WCC		O/B			
(REGION II) Nat'l. Systems	103.9 ( )			73 ( )	1420 ( )	WCC NCC		O/B		Interface to mini, OCR input.	Same as compatible.
WERS (Water Enf. Req.)	129.3	FORTRAN COBOL, IRS		8	1546	WCC	Rg.II	O/B	—	STORET interface.	Same plus IRS usage.
Other REGION II	154.3 37.3				3790 531	WCC NCC		O/B			
(REGION III) Nat'l. Systems	( ) 7.0				( ) 422	NCC WCC		O/B			
Reg. III Other	687.0 38.6				6500 427	WCC NCC		O/B			
(REGION IV) Nat'l. Systems	35.5 75.4				163 3544	WCC NCC		O/B		Interface to mini.	Same as compatible.

PROJECTED CONVERSION WORKLOAD FOR 1981

ORGANIZATION ADP ACTIVITY	ANNUAL BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			COMPATIBLE MAJOR IMPACT AREAS	NON-COMPATIBLE SYSTEM MAJOR IMPACT AREAS
		TYPE	PROG LINES	TAPE REELS	DISK TRACKS		NO. LOC	USE MODE	USER SW		
(REGION V) Nat'l. Systems	271.4 101.5				6085 24504	WCC NCC		O/B		Interface to PDP 11/70, Data base conversion.	Same as compatible.
Other Region V	452.1 78.8				11728 4367	WCC NCC		O/B			
(REGION VI) Nat'l. Systems	266.0 ( )				876 ( )	WCC NCC		O/B			
RRS (Regional Rept.)	29.3	PL/1		-	25	WCC	Reg. VI	O/B	-	Graphics output, PCS interface.	Same as compatible.
Other Region VI	142.6 18.2				5967 254	WCC NCC		O/B			
(REGION VII) Nat'l. Systems	58.3 4.3				1700 56	WCC NCC		O/B			
IAMS	16.7	COBOL		—	166	WCC	Reg. VII	O/B			
Other Region VII	139.0 11.1				72 576	WCC NCC		O/B			

PROJECTED CONVERSION WORKLOAD FOR 1981

ORGANIZATION ADP ACTIVITY	ANNUAL BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			COMPATIBLE MAJOR IMPACT AREAS	NON-COMPATIBLE SYSTEM MAJOR IMPACT AREAS
		TYPE	PROG LINES	TAPE REELS	DISK TRACKS		NO. LOC	USE MODE	USER SW		
(REGION VIII) Nat'l. Systems	45.9 29.5				291 376	WCC NCC		O/B			
Management	63.1	PL/1		-	96	WCC	Reg. VIII	O/B	-		PL/1 usage.
MSIS	21.3			30	1276	WCC		O/B			
REG. VIII Other	163.4 3.3				2143 162	WCC NCC		O/B			
(REGION IX) Nat'l. Systems	107.2 17.2				1539 532	WCC NCC		O/B			State of Cal. use of GICS-MARK IV
Other Region IX	270.0 9.6				4665 834	WCC NCC		O/B			PL/I, IRS, Easy-trieve usage.
(REGION X) Nat'l. Systems	75.6 6.4				297 26	WCC NCC		O/B		PDP 11/70 Interface	Same as compatible.
Water Qual. Models	74.7	FORTRAN PL/1 BASIC		-	231	WCC	Reg X	O/B	-		Software mix, PL/1 and BASIC usage.

PROJECTED CONVERSION WORKLOAD FOR 1981

ORGANIZATION ADP ACTIVITY	ANNUAL BILLING	SOFTWARE		DATA BASE		SYSTEM SUPPLIER	PRIMARY USERS			COMPATIBLE MAJOR IMPACT AREAS	NON-COMPATIBLE SYSTEM MAJOR IMPACT AREAS
		TYPE	PROG LINES	TAPE REELS	DISK TRACKS		NO. LOC	USE MODE	USER SW		
Regional Mgmt. Sys.	92.3	IRS COBOL		-	6582	WCC	Reg. X	O/B	-	Non-standard COBOL.	Same plus IRS usage.
Other Region X	54.7 .3				389 -	WCC NCC		O/B			